Adherence to insulin in children and young people with Type 1 diabetes

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Abstract

Introduction

Type 1 diabetes is an autoimmune condition that results in the inability of the pancreas to produce insulin. The mainstay of treatment for this disease is administration of exogenous insulin. Adherence to this therapy is vital in avoiding both life-threatening short-term complications and life-limiting long-term complications. Despite its importance, it is an area that many children and young people struggle with. While there are a huge number of studies that attempt to identify individual factors affecting adherence, to date there have been no studies that attempt to draw these factors together into a single systematic review.

Aims

The aim of this project is to undertake a systematic review of insulin adherence in children and young people with T1DM, to understand what impact the factors studied have, and determine the areas that have/have not been researched with a view to guiding future research.

Methods

A systematic review was undertaken following a search of five medical databases aided by extensive training on optimising searches. The PICO framework was used to create inclusion/exclusion criteria that was used decide which studies to include in the review based on agreement of two reviewers. The key inclusion criteria stated that study participants must be humans, under the age of 18, with a diagnosis of T1DM and receiving insulin therapy. All study types that contained primary data were included.

Included studies had relevant information entered into a data extraction tool, which could then be used to perform quality assessments and thematic analysis.

Results

One thousand three hundred and six studies were identified, of which 76 were included in the final analysis. Two hundred and thirty-six factors were assessed for association with adherence, using 38 different methods. Eleven factors were assessed by four or more studies. Age was the most commonly assessed factor (33 studies), followed by HbA1c/glycaemic control (20 studies), duration of diabetes (19 studies) and gender (15 studies). There were 210 factors (89%) that were only considered in a single study.

Overall, 9 969 children and young people have been included in studies assessing adherence to insulin (mean: 133, range: 28 to 1 028). Formal meta-analysis was not able to be performed due to the large number of different methods of measuring adherence, methods of data presentation and differences in populations studied. Amongst the factors that have been assessed by multiple studies, there were some that displayed good agreement between studies on the direction of the effect on insulin adherence. Increasing age, depression (in the child/young person) and smoking frequency showed good agreement between studies for decreased adherence. Higher self-efficacy, family support, exercise frequency, increased responsibility taken by the child, higher socio-economic status and better parent-child relationship showed good agreement between studies for improved insulin adherence.

Factors were divided into overarching themes: demographics, past medical history, diabetes management, psycho-social or family dynamics. Factors assigned to the demographics theme were the most frequently assessed by multiple studies. The most commonly assigned theme was the psycho-social theme, though the vast majority (93.1%) of these factors were assessed by a single study.

PENDANT Study

This prospective cohort study was designed with the aim of assessing the correlation between disease severity at diagnosis with a variety of psycho-social outcomes with a view to exploring their relationship with later adherence to insulin therapy. Recruitment for the study was interrupted by the COVID-19 pandemic after two patients had entered the study. The findings of this initial recruitment phase and the systematic review will be used to improve the study going forwards.

Conclusion

Insulin adherence has been assessed in multiple studies, but the variety of methods and heterogeneous populations make comparisons difficult. Harmonising methodologies for assessing adherence to insulin would enable improved assessment of factors affecting adherence to this critical medication and lead to the identification of potential barriers to target to improve adherence in T1DM in the future. Future studies could aim to assess modifiable factors that are currently under-researched, while also aiming to assess adherence in a way that considers the complex nature of adherence to insulin therapy.

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List of abbreviations

ACE	Angiotensin Converting Enzyme
ADHD	Attention Deficit Hyperactivity Disorder
ADQ	Adherence in Diabetes Questionnaire
Anti-VP4	Anti-Viral Protein 4
APA	American Psychological Association
ARB	Angiotensin Receptor Blocker
AXIS	Appraisal Tool for Cross-Sectional Studies
β-cell	Beta-cell
BGM	Blood Glucose Monitoring
BMI	Body Mass Index
CAR	Chimeric Antigen Receptor
CBT	Cognitive Behavioural Therapy
CD14	Cluster of Differentiation 14
CD4+	Helper T lymphocytes
CD8+	Cytotoxic T lymphocytes
CFRD	Cystic Fibrosis-Related Diabetes
CGM	Continuous Glucose Monitoring
ChEDS	Eating Disorders in Diabetes Questionnaire
CIMT	Carotid Intima-Media Thickness
CSII	Continuous Subcutaneous Insulin Infusion
CTCA	Computed Tomography Coronary Angiography
CTLA	Cytotoxic T Lymphocyte Antigen
DFRQ	Diabetes Family Responsibility Questionnaire
DH-Data	UK Department of Health's Library and Information Services
DKA	Diabetic Ketoacidosis
DRAQ	Diabetes Regimen Adherence Questionnaire
DRCQ	Diabetes Regimen Compliance Questionnaire
DSMP	Diabetes Self-Management Profile
DSS	Diabetes Social Support Questionnaire
ECG	Electrocardiogram
EMBASE	Excerpta Medica Database
ESRD	End-Stage Renal Disease
exp	Explode (database search function)
FcγRII	Low-Affinity IgG Binding Receptor
GAD	Generalised Anxiety Disorder
GAD-7	General Anxiety Disorder 7
GI	Gastro-Intestinal
GP	General Practitioner
GRADE	Grading of Recommendations, Assessment, Development and Evaluations
HbA1c	Glycated Haemoglobin
HDAS	Healthcare Databases Advanced Search
HLA	Human Leukocyte Antigen
HMIC	Healthcare Management Information Consortium
IFIH1	Interferon Induced with Helicase C Domain 1

IFN-α	Interferon-Alpha
IFN-β	Interferon-Beta
MDI	Multiple Daily Injections
MDT	Multi-Disciplinary Team
MeSH	Medical Subject Headings
MHC	Major Histocompatability Complex
Mmol/mol	Millimoles per Mole
MODY	Maturity-Onset Diabetes of the Young
MPR	Medication Possession Ratio
NHS	National Health Service
NICE	National Institute of Health and Care Excellence
NOS	Newcastle-Ottawa Scale
OAS1	Oligoadenylate Synthase 1
OCD	Obsessive Compulsive Disorder
PAID	Problem Areas in Diabetes Questionnaire
PAID-C	Problem Areas in Diabetes Questionnaire – Child Version
PAID-T	Problem Areas in Diabetes Questionnaire – Teen Version
PedsQL	Paediatric Quality of Life Questionnaire
PGE_2	Prostaglandin E_2
PGI_2	Prostaglandin I_2
PHQ-9	Patient Health Questionnaire 9
PIP	Paediatric Inventory for Parents
PISs	Participant Information Sheets
P-PAID-C	Problem Areas in Diabetes Questionnaire - Parent of Child Version
P-PAID-T	Problem Areas in Diabetes Questionnaire – Parent of Teen Version
PROs	Patient-Reported Outcomes
PTSD	Post-Traumatic Stress Disorder
QoL	Quality of Life
RCPCH	Royal College of Paediatrics and Child Health
RCT	Randomised Control Trial
RoB 2	Revised Cochrane Risk of Bias Tool for Randomised Trials
RSQ	Response to Stress Questionnaire
SED	Self-Efficacy for Diabetes Questionnaire
SMBG	Self-Monitoring of Blood Glucose
SCI	Self-Care Inventory
SCI-R	Revised Self-Care Inventory
T1DM	Type 1 Diabetes Mellitus
T2DM	Type 2 Diabetes Mellitus
Tregs	Regulatory T Cells
TSCC	Trauma Symptoms Checklist for Children
TSCYC	Trauma Symptoms Checklist for Young Children
UK	United Kingdom
U/h	Units per hour
US/USA	United States/United States of America
VNTR	Variable Number of Tandem Repeats

WE-CARE	Wellbeing and Satisfaction of Caregivers of Children with Diabetes Questionnaire
WHO	World Health Organisation

1. Introduction

1.1. Pathophysiology

Type 1 diabetes mellitus (T1DM) is a disease characterised by a complete lack of insulin production from the beta cells of the Islets of Langerhans within the pancreas (1). Though some remission of T1DM is common after following initiation of therapy, this “honeymoon phase” only lasts an average 7 months before insulin production ceases permanently (2).

In the majority of cases, this is caused by autoimmune destruction (type 1A) of the beta cells. In less than 10% of patients, the pathogenesis is idiopathic, with destruction/failure of the beta cells without any evidence of autoimmunity (type 1B) (3). The first clinical symptoms usually appear after approximately 80% of the total beta cell mass has been destroyed. This is often precipitated by a time of increased insulin demand, such as during stress or infection (4).

The exact underlying trigger of T1DM is a complicated interaction of genetic and environmental factors that is still not fully understood.

The main genetic component is attributed to certain haplotypes of the human leukocyte antigen (HLA) complex; specifically, HLA-DR3 and/or HLA-DR4 subtypes (5). Over 90% of T1DM patients possess one of these particular subtypes, versus around 40% of people without the disease (6). These HLA molecules are responsible for allowing helper T lymphocytes (CD4+) recognise antigens, thereby triggering an immune response (1).

Other contributing genes include the insulin gene promoter (insulin variable number of tandem repeats - VNTR) and the cytotoxic T lymphocyte antigen-4 (CTLA-4) (5).

There are three classes of insulin VNTRs, with the number on tandem repeats increasing from class 1, to 2, to 3 (7). Class I is associated with an increased risk of developing T1DM, whereas class III has a protective effect (7).

CTLA-4 is expressed by T cells and acts as an inhibitory receptor with certain alleles conferring to substantially increased risk of T1DM and other autoimmune conditions such as rheumatoid arthritis (7). Of particular interest is the contribution of CTLA-4 to the development of autoimmune thyroid

disease (7), which is the most common autoimmune disorder associated with T1DM, with a quarter of children with T1DM having thyroid autoantibodies at diagnosis (8).

The presence of specific genes alone is not sufficient to guarantee the development of T1DM, making the relationship between T1DM and family history a complicated one; 85% of T1DM patients have no family history (9). In fact, the population seeing the greatest increase in their incidence rate is the genetically low risk population, suggesting that the contribution of environmental factors to development of the disease is increasing, though the reasons for this are not currently clear (5).

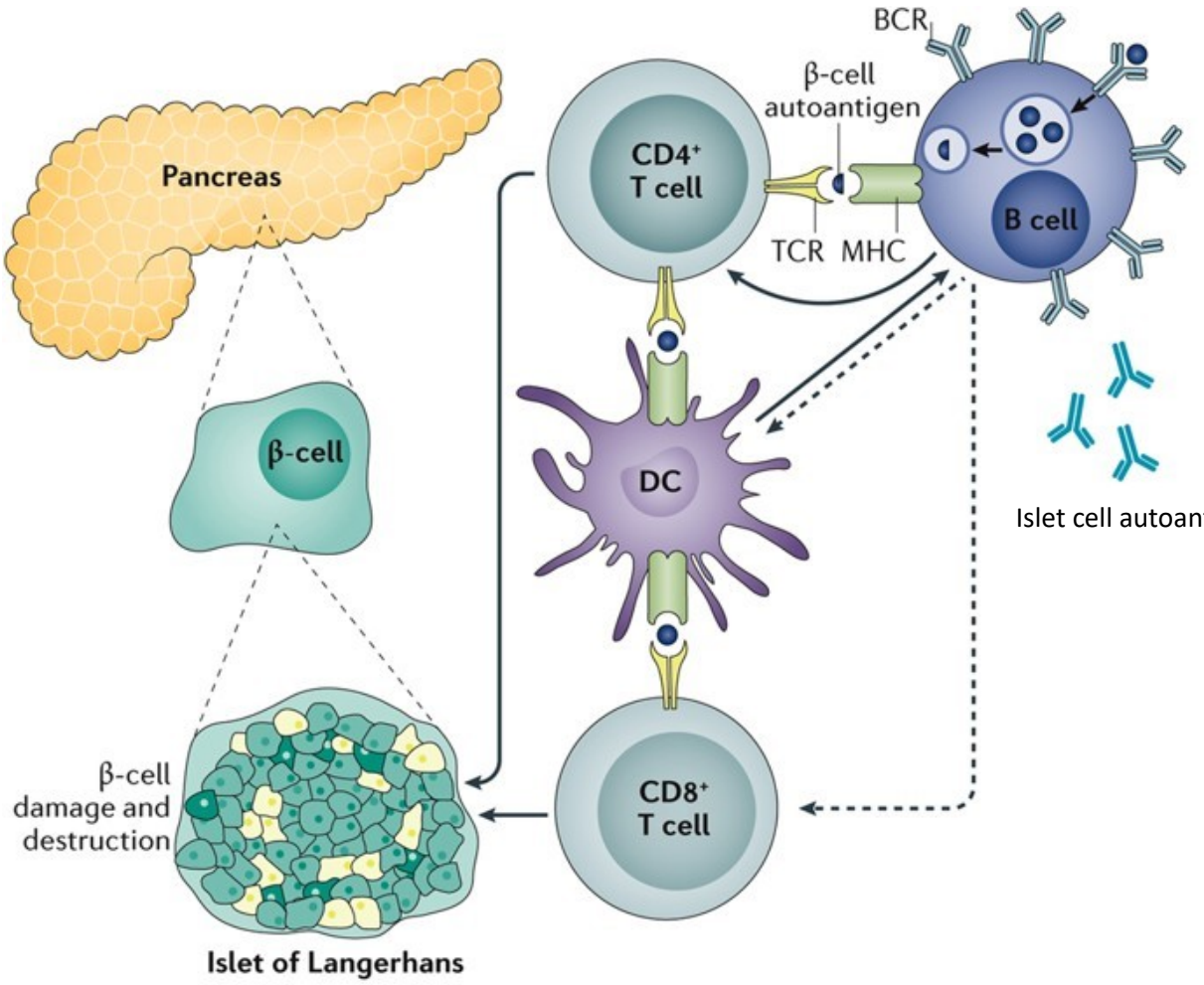

Figure 1.1 Pathophysiology of T1DM. Legend; CD4+ T cell: Helper T cell, CD8+ T cell: Cytotoxic T cell, ß-cell: beta-cell, MHC: Major Histocompatability Complex, BCR: B-cell receptor, TCR: T-cell receptor, DC: dendritic cell. Adapted from (10)*. A ß-cell autoantigen is presented to the CD4+ and CD8+ T cells and the B cell via interface between T cell receptors and major histocompatibility complexes. This causes the CD8+ T cell to have direct cytotoxic effects upon the ß-cells within the Islets of Langerhans, which are propagated by the effect of the CD4+ T cell and the islet cell autoantibodies produced by the B cell. The islet cell autoantibodies also have a direct damaging effect upon the ß-cells.*

The risk of an individual with a positive family history developing T1DM varies depending on which other family member is affected. The maternal impact appears to be the least strong, with 2-4% of individuals with a mother with T1DM going on to develop the disease, compared with 6-9% of individuals with a father with T1DM (11). Concordance (the incidence of both siblings being affected) between non-monozygotic twin siblings is around 10% (11).

Monozygotic twin studies show a concordance rate of around 50% (12). Even in the studies that suggest higher concordance, this number is always significantly short of 100% (11).

One of the more extensively studied environmental factors is viral infection. The main viruses implicated in the development of T1DM are enteroviruses, such as coxsackievirus B. In a Finnish study (13), the appearance of islet autoantibodies correlated with the seasonal variance of enterovirus infection.

The mechanism by which these viral infections can trigger an autoimmune response is not clear, and there are multiple proposed mechanisms depending on the virus implicated (14).

In the case of coxsackievirus B, it produces an inflammatory response in the islets of Langerhans, which would lead to introduction of autoantigens as part of the inflammatory process. The virus also possesses proteins that molecularly strongly resemble an amino acid found within the pancreatic beta cells, causing an autoimmune response via molecular mimicry (14) (15). Other proposed mechanisms include direct destruction of beta cells by a virus or causing an imbalance between cytotoxic and regulatory T cells (Tregs), in favour of cytotoxic T cells (15) (Figure 1.2).

It is worth noting that no viral vaccine – even in individuals with high-risk alleles – has been shown to increase the risk of developing T1DM (14). In fact, there is some evidence in favour of the inverse relationship, with the early immune response granted by vaccination potentially reducing viral infection of the Islets of Langerhans within the pancreas, thereby protecting against inflammation and destruction (14).

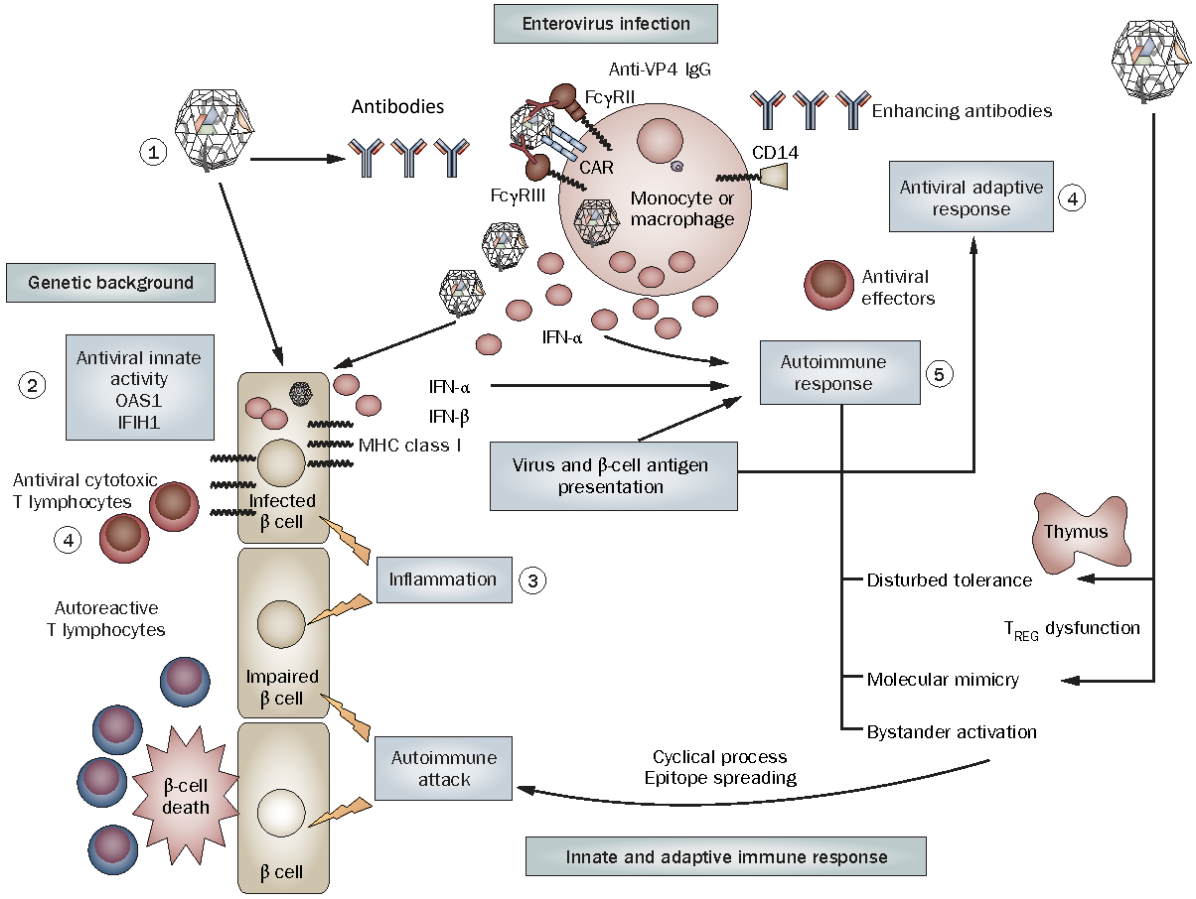

Figure 1.2 Proposed mechanisms leading to Type 1 Diabetes following enterovirus infection. Legend; Anti-VP4 IgG: anti-Viral Protein 4 Immunoglobulin G, FcyRII: low-affinity IgG binding receptor, CAR: Chimeric Antigen Receptor, CD14: Cluster of Differentiation, IFN-α: Interferon Alpha, IFN-β: Interferon Beta, MHC: Major Histocompatability Complex, OAS1: Oligoadenylate Synthase 1, IFIH1: Interferon Induced with Helicase C Domain 1. Adapted from Hober et al. (16) *Following enterovirus infection and the innate response of the immune system, the adaptive immune response begins with presentation of viral antigens and β-cell antigens from cells that have been infected with the virus. The viral antigen presentation is part of the desired immune response and ultimately contributes to the resolution of the infection, but the β-cell antigen presentation results in an autoimmune response via activation of T cells production of β-cell autoantibodies against the β-cells. This autoimmune response does not happen in all individuals who have an enterovirus infection. The exact reasons for this are incompletely understood, but certain genetic variations – particularly in some subtypes of HLA – have been closely associated.*

1.2. Epidemiology

Type 1 diabetes mellitus (T1DM) accounts for 5-10% of all cases of diabetes worldwide, with the remainder being made up of type 2 diabetes mellitus (T2DM), maturity-onset diabetes of the young (MODY) or cystic fibrosis-related diabetes (CFRD) (9). In children however, around 95% of diabetes is type 1 (Table 1.1) (9).

Type 2 diabetes mellitus (T2DM) in children is a relatively new occurrence, with the first cases being officially diagnosed the UK in 2000 (though earlier cases had been reported in the US in some Native American populations) (17). These first UK cases were all in overweight girls of Asian origin, who have a roughly 9-fold increased risk of developing T2DM when compared with their Caucasian counterparts (in whom the first diagnosis occurred two years later) (9). Even in this higher-risk group, T2DM is still comparatively rare in children (17).

T1DM is the most common metabolic disease in young people (18). Thirty thousand children in the UK are currently living with T1DM and incidence is increasing by about 4% every year. This gives the UK one of the highest rates of T1DM worldwide – only 4 countries have a higher incidence (Table 1.2) (19). Incidence is also increasing worldwide, at a rate of around 3% per year. Only one country – Sweden – has reported a steady incidence rate (5). If the worldwide trend were to continue at this rate for the next decade, the number of T1DM cases would nearly double (5).

There is a huge range of incidence worldwide, with the highest incidence of 57.6 per 100 000 children (in Finland) being nearly 600 times that of the lowest incidence of 0.1 per 100 000 (in Papua New Guinea and Venezuela) (19). Interestingly, there is even a huge variance in incidence between nearby countries. For example, the distance between Estonia and Finland is around 75 miles, but Finland has around 3 times the T1DM incidence rate of Estonia (where the incidence is 17.1 per 100 000) (5).

Type of Diabetes	Percentage of Total Diabetes Cases in Children (under the age of 19)
T1DM	95.1%
T2DM	1.9%
MODY, CFRD and Undefined Diagnosis	2.73%
Other Types	0.27%

Table 1.1 Types and prevalence of different type of diabetes in children. Adapted from: Diabetes UK (9). *Legend; T1DM: Type 1 Diabetes. T2DM: Type 2 Diabetes. MODY: Maturity-Onset Diabetes of the Young. CFRD: Cystic Fibrosis-Related Diabetes.*

Country	Incidence per 100 000 Children Between the Ages of 0 and 14
Finland	57.6
Sweden	43.1
Saudi Arabia	31.4
Norway	27.9
UK	24.5
USA	23.7
Australia	22.5
Kuwait	22.3
Denmark	22.2
Canada	21.7
Netherlands	18.6
Germany	18
New Zealand	18
Poland	17.3
Czech Republic	17.2
Estonia	17.1
Puerto Rico	16.8
Ireland	16.3
Tanzania **Paraguay**	0.9
Zambia	0.8
China	0.6
Dominican Republic **Pakistan** **Peru**	0.5
Ethiopia **Thailand**	0.3
Papua New Guinea **Venezuela**	0.1

Table 1.2 Incidence of Type 1 Diabetes throughout the world. Adapted from Diabetes UK (19).

One proposed reason for the increasing incidence of T1DM is the hygiene hypothesis, which suggests that exposure to a range of pathogens in early childhood decreases the incidence of immune-mediated diseases such as asthma and T1DM (20). This effect has been demonstrated in mice; individuals raised in sanitary conditions develop T1DM at a higher rate than those raised in less sanitary conditions (20).

Unlike other autoimmune conditions, which tend to affect women more often, T1DM appears to affect both males and females equally (5). Incidence tends to increase with age up until puberty, after which it begins to decline (Figure 1.3) (10).

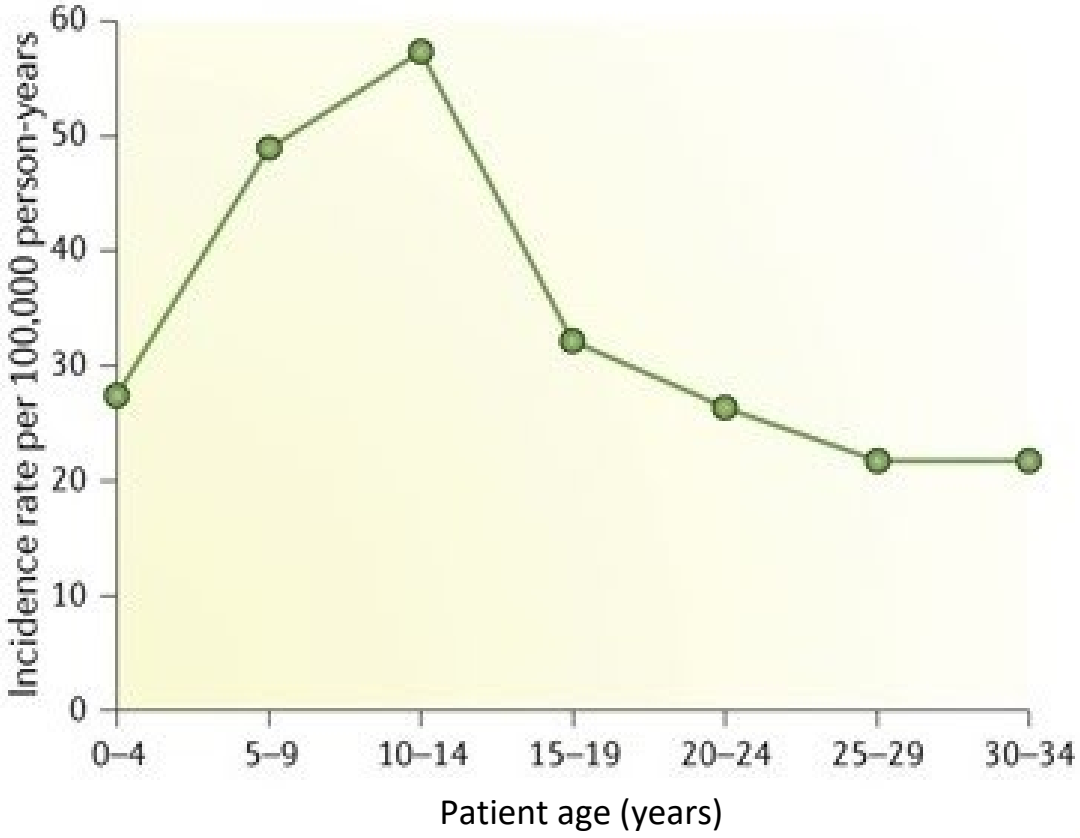

Figure 1.3 Age-related incidence rate of T1DM. Adapted from (10).

1.3. Treatment

In the UK, NICE (National Institute of Health and Care Excellence) has published guidance on how T1DM should be managed in children (21).

The mainstay of T1DM treatment is insulin replacement, given via varying methods of subcutaneous injection (22).

The mechanism of action of insulin varies slightly in each of the tissues where it acts, but all have the net effect of reducing blood glucose levels (23). In skeletal muscle, insulin promotes storage of glucose as glycogen, as well as promoting use of glucose by the cells (23). In the liver, as with in skeletal muscle, insulin increases the storage of glucose as glycogen and additionally increases fat formation from glucose (lipogenesis) and decreases the formation of glucose from non-carbohydrate sources (gluconeogenesis) (23). It achieves this through mediation of gene expression (23). Lastly, in white adipose tissue (WAT), insulin decreases the breakdown of fat into glucose (lipolysis), while promoting its storage as fat via lipogenesis (23).

On a molecular level, all of these mechanisms are started when insulin binds to an insulin receptor on the cell surface membrane, triggering a cascade that ultimately results in the movement of glucose transport proteins (GLUT-4) to the cell surface (23). The concentration of glucose outside of the cell is greater than the concentration of glucose inside of the cell, and so glucose can enter the cell through the GLUT-4 proteins via facilitated diffusion (24).

The two main regimens of insulin therapy that are used in children are

- Multiple Daily Injection (MDI)
- Continuous Subcutaneous Insulin Infusion (CSII), commonly known as insulin pump therapy and

MDI consists of short or rapid-acting insulin before meals and snacks and long-acting insulin at least once per day (21).

There are 5 main types of insulin, separated according to their duration of action and time of onset (25). Table 1.3 details the 5 types of insulin and their role in the treatment of T1DM.

In CSII, insulin is delivered via an indwelling cannula that is connected to a programmable pump (21). These devices usually contain rapid or short-acting insulin that is delivered automatically at a programmable variable basal rate, with boluses for meals/snacks controlled manually by the patient (21). This method is often considered if the first-line MDI treatment is unsuitable for the patient's lifestyle or if their glycaemic control on MDI has been consistently poor (21).

There are currently 9 insulin pumps on the market in the UK, each with their own pros and cons. Most pumps are "tethered", meaning that the pump is connected to a thin section of plastic tubing that delivers the insulin to the patient, though some are "patch" pumps, which attach directly to the skin and as such, do not require any tubing (26). Pumps can also be "integrated", meaning that they can communicate directly with a CGM (26). Patients using pumps that lack this capability will either use SMBG or will have a separate CGM device (26). Table 1.4 summarises the 9 pumps currently available in the UK and some of their key features.

Type of Insulin	Examples (brand name)	Approximate time to onset	Approximate time to peak of action	Approximate duration of effect	Role in treatment
Rapid-acting	• Insulin lispro (Admelog, Humalog) • Insulin aspart (Fiasp, NovoLog)	15 minutes	1 hour	2-4 hours	Taken before meals
Short-acting	• Regular insulin (Humulin R, Novolin R, Velosulin R)	30 minutes	2-3 hours	3-6 hours	Taken before meals
Intermediate-acting	• Insulin isophane/NPH (Humulin N, Novolin N, ReliOn)	2-4 hours	4-12 hours	12-18 hours	Usually taken twice per day to cover elevations in glucose when rapid/short-acting insulin wears off. May be combined with rapid/short-acting insulin in a mixed insulin regimen.
Long-acting	• Insulin detemir (Levemir) • Insulin glargine (Lantus)	3-4 hours	No defined peak	Up to 24 hours	Usually taken once or twice per day to cover elevations in glucose when rapid/-acting insulin wears off
Ultra-long-acting	• Insulin degludec (Tresiba) • Insulin glargine u-300 (Toujeo)	6 hours	No defined peak	Up to 36 hours	May be useful in patients for whom regular injections prove challenging

Table 1.3 Summary of types of insulin, their times of action and their roles in treatment of T1DM. Legend; insulin NPH: insulin Neutral Protamine Hagedorn. Adapted from (25,27).

	Accu-Check Combo (28)	**Accu-Chek Insight** (29)	**MiniMed Paradigm Veo** (30)	**Minimed 640G** (31)	**Mylife OmniPod** (32)	**Mylife YpsoPump** (33)	**DANA Diabecare R** (34)	**DANA Diabecare RS** (35)	**A6 TouchCare** (36)
Features	• Handset is both a blood glucose meter and a bolus calculator	• Handset is a blood glucose meter, bolus calculator, data manager and remote control for the pump	• Low glucose suspend feature	• Algorithm that attempts to predict hypos and prevent them via suspension of basal insulin	• Handset is also a blood glucose meter	• Links to smartphone app to allow bolus calculation and data sharing	• Handset is also a blood glucose meter • Can connect to smartphones to act as a remote control for the pump	• Can connect to smartphones to act as a remote control for the pump	• Low glucose suspend feature
CGM integration? (Y/N)	Y	Y	Y	Y	N	N	Y	Y	Y
Tethered/patch	Tethered	Tethered	Tethered	Tethered	Patch	Tethered	Tethered	Tethered	Patch
Basal settings	• Minimum 0.05U/h • Maximum 50U/h • Minimum adjustable increment of 0.01U • Option for 5 different basal profiles • Option for temporary basal	• Minimum 0.02U/h • Maximum 25U/h • Minimum adjustable increment of 0.01U • Option for 5 different basal profiles • Option for TBR	• Minimum 0.025U/h • Maximum 35U/h • Option for 48 basal rates over the day, between 3 different patterns	• Minimum 0.025U/h • Mximum 35U/h • Option for 48 different basal rates over the day between 8 pre-set patterns	• Minimum 0.05U/h • Maximum 30U/h • Option for 7 different basal programmes, with each programme having the option of 48 different basal rates over the day between 24 pre-set patterns	• Minimum 0.02U/h • Maximum 40U/h • Minimum adjustable increment of 0.01U/h • Option of 2 different basal programmes, with up to 24 rates over the day per programme	• Minimum 0.04U/h • Maximum 16U/h • Minimum adjustable increment of 0.01U/h • Option of 4 different basal programmes with each profile having adjustable hourly rates	• Minimum 0.04U/h • Minimum adjustable increment of 0.01U/h • Option of 4 different basal programmes with each profile having adjustable hourly rates	• Minimum 0.05U/h • Maximum 10U/h • Minimum adjustable increment of 0.05U/h • Option for 5 different basal programmes, with each having the option of 48 different basal rates per day

	Accu-Check Combo (28)	**Accu-Chek Insight** (29)	**MiniMed Paradigm Veo** (30)	**Minimed 640G** (31)	**Mylife OmniPod** (32)	**Mylife YpsoPump** (33)	**DANA Diabecare R** (34)	**DANA Diabecare RS** (35)	**A6 TouchCare** (36)
	rate (TBR)								
Bolus settings	• Up to 50U • Can be delivered as quick, standard, extended or multiwave boluses	• Up to 50U • Can be delivered as standard, extended and multiwave boluses	• Up to 75U • Can be delivered as standard, square wave and dual wave boluses	• Up to 75U • Can be delivered as standard, dual and square wave boluses	• Up to 30U	• Up to 30U	• Up to 80U • Can be delivered as extended or dual pattern boluses	• Up to 80U • Can be delivered as extended or dual pattern boluses	• Up to 25U • Can be delivered as normal, extended and combo boluses

Table 1.4 Insulin pumps currently available in the UK and their features. Legend; U: units, U/h: units per hour, Y: yes, N: no. Adapted from (37).

All insulin regimens require some sort of monitoring of blood glucose levels, which in the first instance is usually done with Self-Monitoring of Blood Glucose (SMBG), where the patient will take their own capillary blood glucose a recommended 5 times per day (21). Alternatively, patients may have Continuous Glucose Monitoring (CGM), where a sensor continually monitors the glucose levels in the interstitial fluid via a cannula just under the skin (38). These can be "standalone", where the patient can view their glucose levels via a separate device or "integrated", where the CGM is connected to a pump, which can display glucose levels in addition to delivering insulin (38).

Management of children with diabetes is typically done via a multi-disciplinary team (MDT) approach (21). Teams should comprise of diabetologists, dieticians, nurse educators/diabetes nurse specialists and clinical psychologists (21). It is recommended that children with diabetes be seen in an outpatient clinic at least 4 times per year (21).

As a part of the 4 clinic appointments each year, patients should also attend an annual review where they receive screening for autoimmune thyroid disease (21) at all ages, and screening for diabetic nephropathy and cardiovascular risk factors (including blood pressure, lipid levels, BMI and smoking status) from the age of 12 (21). Additionally, screening for diabetic retinopathy and peripheral vascular disease and neuropathy (via assessment of the feet) should also be done annually from the age of 12 (21). Most of these assessments will be done at the time of the annual review appointment (21) though the retinopathy screening is usually done by an optician (39).

HbA1c (glycated haemoglobin) is the primary outcome measure for diabetes with a target of 48mmol/mol or lower (40), and while this has improved significantly in over the past decade, from an average HbA1c of 72mmol/mol in the 2005-06 audit period, the average in 2018-19 was still 61.5mmol/mol (40). Figure 1.4 shows some of the improvements in diabetes care in the past decade have impacted HbA1c management (41).

Other outcome measures (as defined by the Royal College of Paediatrics and Child Health – RCPCH (42)) exist relating to microvascular disease (such as kidney and eye disease), large vessel disease and autoimmune disease. These are summarised in Table 1.5.

Most patients expect to transition from paediatric services to adult care between the ages of 17 and 19 years old, though in reality, the mean age of transition is 19.5-20.1 years of age (43). The transition process can be a challenging time for patients and healthcare providers alike with only 14% of transitioning patients meeting their targets for glycaemic control (44) and HbA1c rising from a mean of 58mmol/mol at their last paediatric appointment, to a mean of 77mmol/mol at their first adult visit (45). It has been suggested that the reasons for this worsening in glycaemic control can be attributed to the upheaval that young people often face in their lives around this age, as attendance at university takes them away from their families, as well as financial, educational and social issues which can affect young people whether they are at university or not, all of which can all have a detrimental effect on treatment adherence (46). Around a third of patients report feeling unsatisfied with their transition (47) and unprepared for it (48).

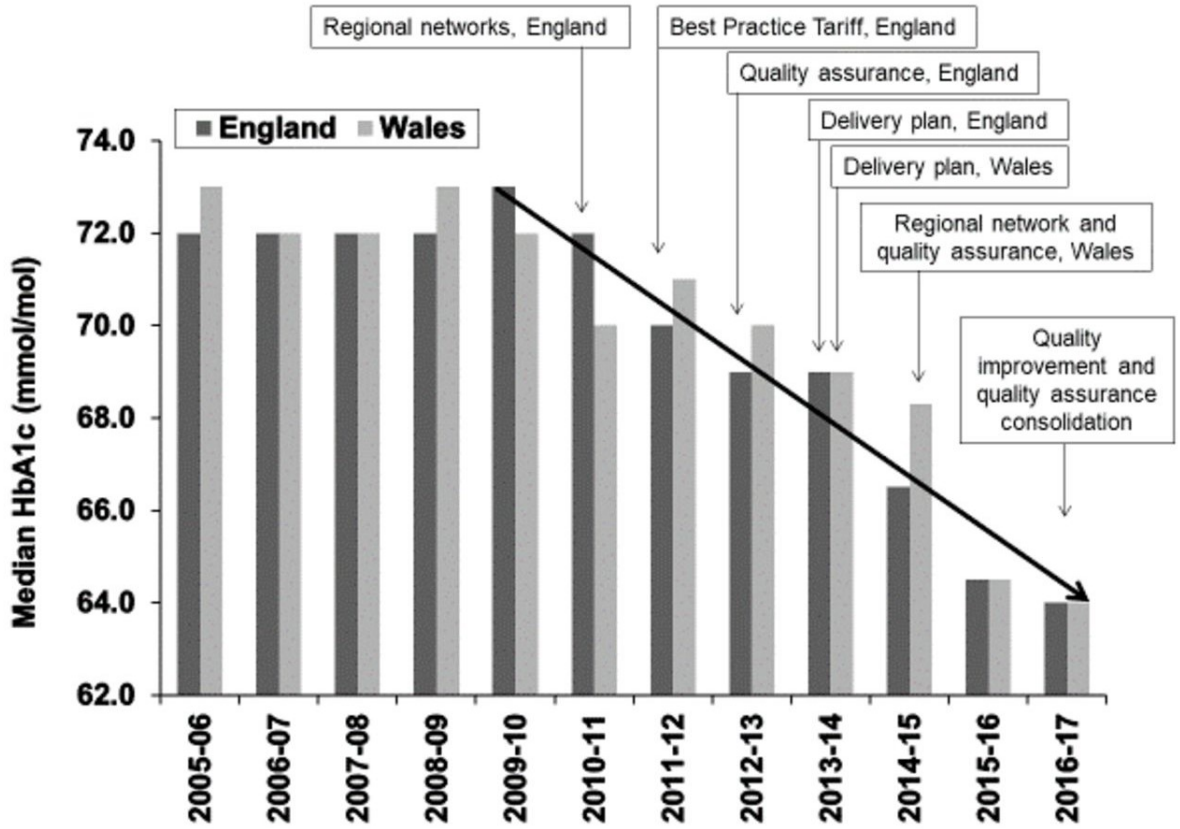

Figure 1.4 Changes to diabetes management in England and Wales since 2005 and associated changes in median HbA1c. Legend; HbA1c: glycosylated haemoglobin, mmol/mol: millimoles per mole. Adapted from (41).

Outcome	Measurement/assessment
Glycaemic control	HbA1c
Kidney disease	Albuminuria
Eye disease	Dilated eye examination
Large blood vessel disease	Blood pressure
	Cholesterol
	Body mass index (BMI)
	Smoking status

Table 1.5 Summary of core outcome measures for T1DM in children, adapted from (42)*. Legend; HbA1c: glycated haemoglobin, BMI: Body Mass Index*

1.3.1. Treatment Adherence

How effective insulin therapy is in achieving good glycaemic control depends hugely on the adherence of the patient with said therapy (49), with the definition of adherence being "the extent to which a person's behaviour coincides with medical or health advice" (50). The terms "compliance" and "adherence" may be used interchangeably, but modern medical literature tends to prefer the term "adherence" as it is seen as a more empowering term for the patient, as opposed to the more paternalistic view of "complying" (50) (51).

T1DM is not a condition where the patient takes their medicine once per day and then forgets about it; following advice on blood glucose monitoring (BGM), diet, exercise, hypoglycaemia management and regular clinic attendance are all required in order to optimise adherence and subsequent glycaemic control (52). Given this long list of tasks, it is perhaps not surprising that time constraints are a frequently reported barrier to adherence (52). Other reported barriers are numerous and wide-ranging and include lack of treatment understanding behavioural issues and fear of hypoglycaemia (53).

Frequency of Blood Glucose Monitoring (BGM) may be used as an objective marker of treatment adherence. When comparing BGM frequency in patients on MDI versus those using CSII, a 2019 study (54) found that CSII users had higher frequency of BGM, inferring better adherence, though this was only statistically different when including the readings registered by the CSII users' CGM device.

The importance of the link between treatment adherence and better diabetes outcomes cannot be overstated; a meta-analysis of 21 studies (that included a total of 2492 adolescents) showed that better treatment adherence is strongly positively correlated with better glycaemic control, irrespective of any demographic variables (55). The impact of adherence is lasting, and children with suboptimal adherence (and subsequent suboptimal glycaemic control) have a higher risk of long-term complications, even if their glycaemic control improves as adults (52).

It is important to be able to assess treatment adherence, so that improved adherence can be promoted, resulting in better diabetes outcomes in both the short and long-term (50). However, unlike for glycaemic control, there is no objective biomarker to measure adherence, meaning that attempts to measure it can pose a challenge (50).

There have been many studies that examine factors that affect adherence, but to date there have been no systematic reviews that attempt to collate this information.

1.4. Complications of T1DM

T1DM is therefore complex, and difficult. Furthermore, the disease has a range of short- and long-term complications that are related to underlying pathophysiology and adherence to treatment, which impacts the survival of patients. The life expectancy of a person with T1DM is reduced by an average of 20 years, when compared with people without T1DM. For T2DM, the average reduction in life expectancy is 10 years (56).

These complications of T1DM can be both short and long term. The long-term complications can be further classified into those that affect the small blood vessels in the body (microvascular) and the large blood vessels (macrovascular). Short-term complications are not classified in this way as their pathogenesis is systemic.

1.4.1. Short-Term – Hypoglycaemia

Hypoglycaemia is generally said to occur when blood glucose is below 4mmol/L (57).

Administration of insulin will decrease the blood sugar. However, in T1DM, either the dose used, or the lack of a normal physiological feedback loop, can cause a hypoglycaemic episode. These are common, and potentially dangerous complications of insulin therapy (58). The average person with T1DM has two episodes of hypoglycaemia (that is serious enough to cause symptoms) per week and up to 40% of these patients will have at least one episode of severe hypoglycaemia (episodes that require treatment with glucagon) each year (58).

The risk of hypoglycaemia goes up with tight glycaemic control. Risk also tends to be higher in individuals who have had T1DM for longer (59). This is because the normal glucagon response to hypoglycaemia tends to become less effective over time, with almost all patients being unable to mount an adequate response after 5 years of the disease (60).

Signs and symptoms of early hypoglycaemia include dizziness, lethargy and sweating and if untreated can even progress to cause collapse and seizures (58). The vast majority of cases never

progress this far and are easily corrected, but it is still a huge worry of diabetic patients; studies have shown that the fear of hypoglycaemia is comparable to that of retinopathy and nephropathy (61). This creates a potential barrier to achieving good glycaemic control, as many patients would rather tolerate slightly higher blood glucose levels than risk having a hypoglycaemic episode (61).

The potential for hypoglycaemia can further negatively impact a patient's mental health and can restrict the activities that patients feel they are able to do, from sporting activities to driving (62).

1.4.2. Short-Term – Hyperglycaemia and Diabetic Ketoacidosis

Like hypoglycaemia, there is some variability as to the precise value that constitutes hyperglycaemia, but it is generally considered to be blood glucose readings above 7.8mmol/L (63).

Some of the most common symptoms of T1DM (such as polydipsia and polyuria) (62) - are as a result of hyperglycaemia (64). The hyperglycaemia results in osmotic diuresis in the kidneys, resulting in dehydration and loss of electrolytes. Other earlier signs of hyperglycaemia include fatigue and headache (65).

If a person remains in untreated hyperglycaemia, they may enter into diabetic ketoacidosis (DKA) (66). Since people with undiagnosed diabetes are not receiving treatment, DKA can be their first presentation of the disease (67). 20% of DKA cases are in previously undiagnosed T1DM patients (68).

In the vast majority of cases, it occurs in people with T1DM, due to their absolute (as opposed to relative, as in T2DM) deficiency of insulin. This absolute deficiency results in an inability of glucose to enter the body's cells, leading to increased glycogenolysis and – more problematically – increased gluconeogenesis (production of glucose from non-carbohydrate sources, which takes place predominantly in the liver), which produces acidic ketone bodies (69). To try and compensate for this decrease in pH, the body attempts to get rid of acidic hydrogen ions by vomiting, which worsens the dehydration and electrolyte loss - initially resulting from polyuria - subsequently impairing renal function (70). With decreased renal function comes decreased glycosuria, worsening the hyperglycaemia, which is further worsened by increased cortisol and growth hormone production, which in turn worsens the polyuria, acidosis, vomiting and dehydration (70) (Figure 1.5).

The classical picture of polyuria, polydipsia and weight loss is seen less commonly in younger children, where it may be misdiagnosed as respiratory disease such as asthma or bronchiolitis (71). This can be an especially dangerous misdiagnosis, as the treatments for these conditions frequently involve the use of corticosteroids, which worsen hyperglycaemia (71).

Treated DKA across all stages of severity has a mortality rate of 2-5% (66), and if left untreated, is invariably fatal (67). In 60-90% of deaths in DKA, the cause of death is cerebral oedema, making it the most common cause of death (71). By the time cerebral oedema has occurred, the mortality rate is around 25% (71). For patients that survive this advanced stage, 10-25% will go on to develop pituitary insufficiency, which can be a significant cause of morbidity requiring lifelong treatment (71).

Around 1 in 10 T1DM patients reported at least one case of DKA in the previous year (69).

Along with the aforementioned polyuria, polydipsia and vomiting, abdominal pain and a history of weight loss are also common (69).

The most common cause of DKA is non-compliance with insulin therapy, accounting for just under half of all cases. Infection is the next most common cause (69).

NICE has published national guidance on how DKA in children should be managed under section 1.4 of their paediatric diabetes management guideline (21). The general principles of DKA management are:

- Rehydration
- Providing insulin
- Correcting electrolyte imbalances (21) (72).

In particular regarding electrolyte imbalances is the provision of potassium, with severe hypokalaemia being the most common derangement during treatment. This occurs due to one of the other effects of insulin, which causes potassium to enter the cells from the blood (73).

If untreated, hypokalaemia can result in potentially fatal cardiac arrhythmias (71). Electrocardiogram (ECG) changes can be seen in the earlier stages of hypokalaemia and as such patients will often have their ECG regularly monitored (71).

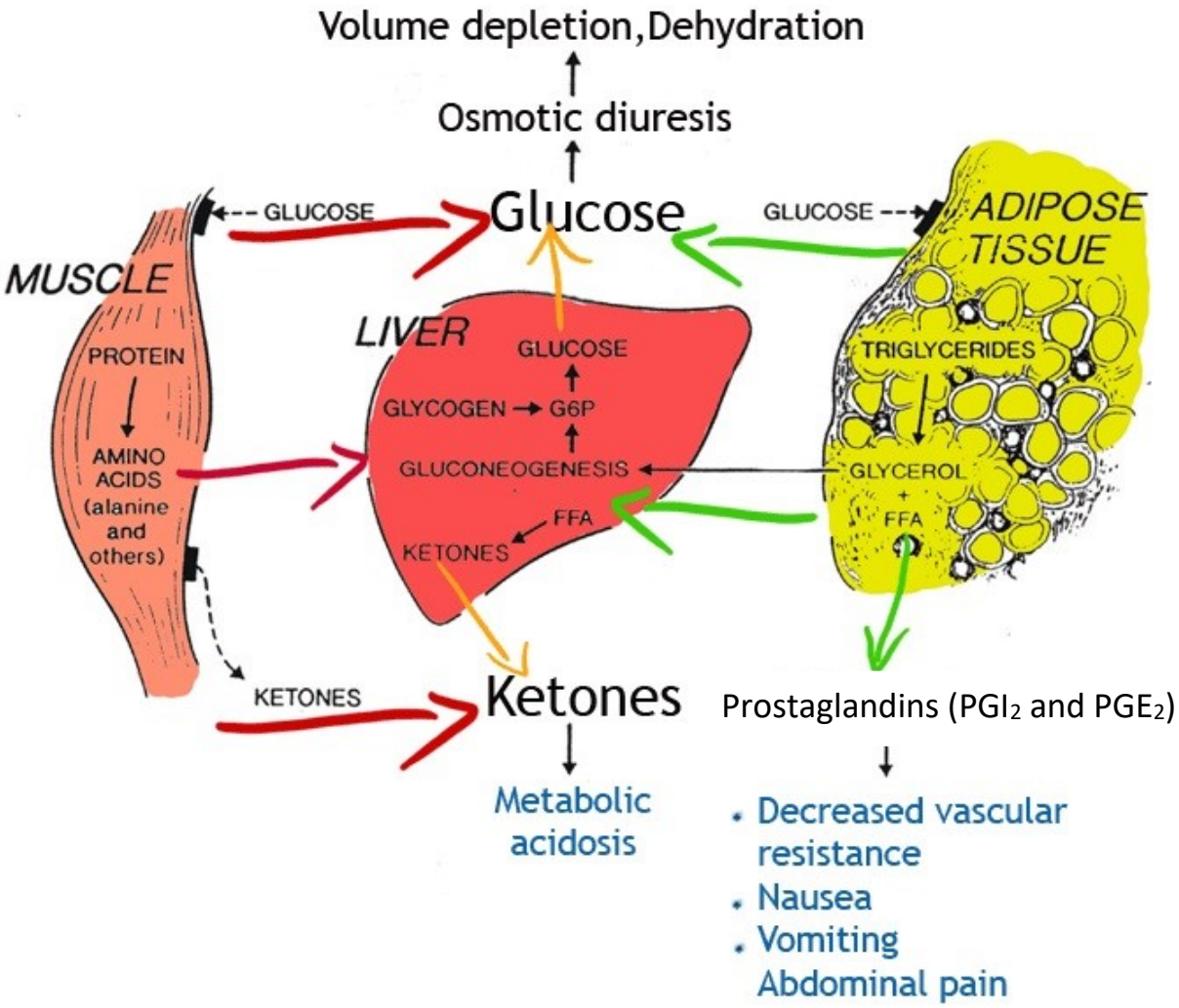

Figure 1.5 Pathophysiology of diabetic ketoacidosis, from Round, J (74).

1.4.3. Long-Term – Retinopathy

Diabetic retinopathy is the most common cause of new-onset blindness in people aged 20-74 (75). In one study, 3.6% of the T1DM patients sampled were legally blind, with diabetic retinopathy being the cause in 86% of cases (76). Though less affected, retinopathy still affects T2DM patients, with the same study finding that 1.6% of type 2 diabetics were blind and that diabetic retinopathy was the cause in around a third of cases (with the significantly lower proportion being due to the higher incidence of other eye diseases in older people) (76).

Presence and severity of diabetic retinopathy is best predicted by the duration of the diabetes diagnosis, with prevalence increasing with each year post-diagnosis (76). Almost all people with type 1 diabetes will have some form of diabetic retinopathy 20 years post-diabetes diagnosis (76).

It begins as mild non-proliferative retinopathy, progressing through to severe non-proliferative retinopathy, before finally becoming proliferative retinopathy (76).

There are multiple mechanisms by which retinopathy causes vision loss, including macular oedema and distortion of the retina itself by the growth of the new blood vessels (55).

The main way of limiting progression of diabetic retinopathy is by achieving good glycaemic control (77).

Time Post-Diagnosis	Prevalence
Any Stage of Retinopathy	
3 years	8%
5 years	25%
10 years	60%
15 years	80%
Proliferative Retinopathy	
3 years	0%
15 years	25%

Table 1.6 Prevalence of diabetic retinopathy over time. Adapted from Fong et al. (76)

Stage of Diabetic Retinopathy	Characteristic Findings
Mild non-proliferative	Increased vascular permeability
Moderate-severe non-proliferative	Vascular closure
Proliferative	Growth of new blood vessels

Table 1.7 Stages of diabetic retinopathy. Adapted from Fong et al. (76)

1.4.4. Long-Term – Peripheral Neuropathy

Neuropathy is the most common complication of diabetes (78) and affects almost 1 in 10 children with T1DM (78). Prevalence increases significantly with age; almost 60% of T1DM patients over the age of 30 are affected (77).

Diabetic neuropathy can affect all nerves within the body, including both motor and sensory peripheral nerves (most common) and the autonomic nerves that supply the cardiovascular and gastrointestinal systems (77). Autonomic neuropathy is one of the contributing factors of diabetes-related sexual impotence in men, with the nerves that supply the urogenital system also becoming damaged (79). Damage to the autonomic nerves supplying the heart can result in unexplained bradycardia and tachycardia as well as silent myocardial ischaemia, which may then go untreated (77).

It usually has an insidious onset of a number of years and can manifest in several different ways, including loss of sensation, pain, or weakness (78).

Quality of life can be seriously negatively impacted by diabetic neuropathy, with 43% of patients reporting at least one of depression, anxiety, or sleep disturbance (78). The aforementioned sensory loss can result in injuries which go undetected, which can then lead to ulcers, affecting 50% of diabetic patients at some point (79). The healing of these ulcers is then further negatively impacted by the increased incidence of peripheral arterial disease in this population (79) (80). If left untreated, limb amputation can become necessary, with diabetic ulcers being the cause of 10% of all amputations (across all ages) (78).

It also carries a significant economic burden and is responsible for around a quarter of all costs related to diabetes treatment (78). Around 40% of people report it affecting their employment, with this group missing an average of 5.5 days of work every month due to pain (77).

The most effective method of prevention, much like other diabetic complications, is good glycaemic control (81) and patients should have a diabetic foot check at least annually (77). If neuropathy does occur, its management revolves around symptomatic relief with analgesia and mitigating further deterioration (82).

1.4.5. Long-Term – Nephropathy

Diabetic nephropathy is the most common cause of kidney disease worldwide (82). Around half of all T1DM patients will be affected at some point in their life and around a quarter of these patients will progress to end-stage renal disease (ESRD), which requires potentially debilitating renal replacement therapy, such as dialysis or even renal transplant (83). Mortality after initiation of haemodialysis is high, with a 5-year survival rate of only 30% (83). Renal transplantation, despite increased short-term mortality, has much improves long-term mortality by around 70% (83). This is still not without its difficulties; hyperglycaemia increases the risk of infection and immunosuppressive drugs impair pancreatic beta-cell function and worsen peripheral insulin risk, which further worsens the hyperglycaemia (84).

The exact mechanism by which diabetes causes kidney damage is uncertain, (84) but much like other diabetic complications, it is significantly linked to glycaemic control (85). There is a demonstrable benefit to good glycaemic control, with just a 1% reduction in HbA1c potentially resulting in a 25% decrease in risk of diabetic complications such as nephropathy (85).

High blood pressure is also strongly correlated with incidence of nephropathy (85); this generally contributes less to the incidence of the disease in T1DM, who are usually younger and as such have not been subjected to years of potential hypertension-inducing factors such as smoking and obesity (82).

The early signs of the disease typically have no obvious symptoms (84) and as such, it is important for all diabetic patients to undergo annual screening (in the form of a urine test for albumin) (82) to increase the chance of early detection.
If nephropathy does occur, blood pressure controlling medications such as Angiotensin Converting Enzyme (ACE) inhibitors and Angiotensin-Receptor Blockers (ARBs) may have a protective effect (82). Young people, however, are severely undertreated, with only a third of people under the age of 20 who have diagnostic nephropathy receiving either of these clinical interventions (86).

1.4.6. Long-Term – Cardiovascular

Cardiovascular complications represent a key factor in the reduction in life expectancy in patients with T1DM (79) (86).

Coronary heart disease, cerebrovascular disease, peripheral arterial disease, cardiomyopathy, and heart failure all fall under the general banner of "cardiovascular disease" and the incidence of all of them is higher in patients with T1DM (87).

While atherosclerotic cardiovascular disease in the general population is almost exclusively a problem of middle-age and above (87), this is not necessarily the case with T1DM patients; even in young adults with T1DM, the incidence of cardiovascular disease is about 1-2% annually (87). Incidence does still increase with age with 70% of men and 50% of women with T1DM showing signs of atherosclerosis by the age of 45 (87).

In addition to age and gender, glycaemic control also has a huge effect on the relative risk of cardiovascular disease, with the worst controlled patients having 10 times the risk of the best controlled patients (87) (though the risk in these patients is still double that of the general population (87). Though the correlation is strong, the underlying mechanism is not clear and is likely to have many contributing factors (87).

Presence of cardiovascular disease in T1DM patients is strongly predicted by the presence of diabetic retinopathy, so presence of this at the recommended annual check would likely prompt further cardiovascular investigation, initially by ECG (87). Additional investigations include Carotid Intima-Media Thickness (CIMT) assessed by ultrasound or Computed Tomography Coronary Angiography (CTCA) (87).

Reducing the risk of cardiovascular disease involves optimal blood glucose management, reduction of cholesterol with statins, blood pressure control and lifestyle measures such as smoking cessation (87). Interestingly, even when management is completely optimised in T1DM patients, they still have a markedly increased risk of cardiovascular disease than the general population; this is not true for T2DM, where optimal management brings the risk back to near baseline levels (88).

1.5. Burden of Diabetes

1.5.1. Economic

The current annual direct cost (with "direct cost" meaning treatment and management of the disease and its complications) of T1DM is estimated at £1 billion (88). It costs close to another £1

billion indirectly (through the effects of increased death and illness) (88). The breakdown of these costs is shown in Table 1.8.

By 2035 these costs are estimated to double to direct costs of £1.8 billion and indirect costs of £2.4 billion (89).

The total annual cost of caring for all forms of diabetes and their complications is £14 billion (89). To put that in perspective, that is the equivalent of:

- £1.5 million per hour
- £25 000 per minute or
- 10% of the entire annual budget of the NHS (53).

Area of Cost	Percentage of Total Cost
Diabetes Medications	7.8%
Non-Diabetes Medications (to treat complications)	15.2%
Inpatient Care	65.8%
Outpatient Care (excluding medications)	9.7%
Other (e.g.- social service)	1.7%

Table 1.8 Healthcare costs associated with Type 1 Diabetes Mellitus. Adapted from Streisand et al. (90)

1.5.2. Psychological Impact

Studies have shown that children with T1DM have higher incidences of emotional and behavioural problems (91).

The very routine required to manage T1DM can have a significant psychosocial impact upon patients and has been described by some researchers as “unrelenting” (92). Injections several times per day, counting of carbohydrates and anticipation and management of hypoglycaemia can combine to form a highly stressful routine; nearly 40% of people feel that their treatment interferes with their lives and over half worry about hypoglycaemia (92). The same study aimed to assess exactly which parts of life diabetes affects, and found that no part of life is immune to effect:

- Physical health (62.2%)
- Emotional well-being (45.2%)
- Finances (44%)
- Leisure activities (38.2%)
- Work-related activities (35.4%)
- Relationships with family and friends (20.5%) (93).

As mentioned above, the routine of diabetes management can be a central point in conflict between parents and children. (94) However, the relationship is a complex one. Addressing conflict through family therapy can improve treatment adherence and glycaemic control (95), but children with better glycaemic control report positive family dynamics even without intervention (92).

Up to 13.6% of family members of people with diabetes report a poor or very poor quality of life and up to 16.2% have WHO-5 scores indicative of depression (18). These figures are similar in the patients themselves (18).

Friends can also have a significant impact on T1DM outcomes. Many young people report that their friends are an important source of support (96). Young people with strong support networks tend to have greater treatment adherence and glycaemic control (96).

Psychological impact can have direct as well as indirect effects on a patient’s glycaemic control. If a patient becomes stressed, the effect of cortisol can lead to increased hyperglycaemia (97). It can also make it more difficult for the patient to complete the tasks required to manage their condition,

such as insulin injections or carbohydrate counting (18). Furthermore, another study showed that using CBT (Cognitive Behavioural Therapy) to treat stress-related depression in T1DM results in improved glycaemic control (98). This relationship is not clear-cut however, as other studies have found no direct relationship between stress and glycaemic control (though they do add that an indirect relationship is likely). This is an area where more work needs to be done; studies have demonstrated conflicting ideas and no study included more than 100 participants. Additionally, whilst several studies have looked at the psychological effect of diabetes as a whole, to date, no studies have assessed the specific impact of diagnosis.

Despite the evidence showing the importance of psychological factors in management of diabetes – whether it be through a direct or indirect effect - and the reflection of this is national management guidelines (99), it is recognised that psychological support for diabetic patients is under-resourced, with only around 10% of patients accessing psychological services (99). Care providers are identifying high numbers of people with diabetes-related psychological issues, but state that they lack the resources to provide these people with the support that they need (100).

Even when removing diabetes from the equation, the individual and societal impact of poor mental health is significant (101). Worldwide, depression is second only to lower back pain as a cause of years lived with disability (and is actually the most common cause in 26 countries) (101). Severe depression can lead to suicide, which is the second most common cause of death for people aged 15-29 (102).

1.6. Aims of Thesis

Despite the critical importance of adherence in long term complication free survival with T1DM, and the varied factors that affect it across childhood and adolescence, the range and impact of these factors has not been examined previously. Therefore, the initial aim of this project is to undertake a systematic review of insulin adherence in children and young people with T1DM, to understand what impact the factors studied have, and determine the areas that have/have not been researched.

The findings of this systematic review will then be used to find potential areas for future study.

2. Systematic Review Methodology

2.1. Background

This review was titled "Factors Affecting Adherence to Insulin in Children and Young People with Type 1 Diabetes".

With an ever-growing number of scientific studies, it can be difficult, if not impossible, for clinicians to keep up to date with every new study that is published (103). Systematic reviews are an effective way of collecting all available information on a particular topic, assessing the risk of bias and quality of the studies and thus summarising the scientific consensus, making them an important step between primary research and the application of it in clinical practice (103).

The PRISMA checklist (104) is an evidence-based system designed to provide structure to and improve the reporting of systematic reviews. It is primarily used for systematic reviews that report on RCTs but can also be used for reviews that use studies of other methodology (104) and as such, was used to guide the reporting of this review.

2.2. Methods

2.2.1. Inclusion and Exclusion Criteria

This systematic review was undertaken in accordance with the PRISMA checklist on systematic reviews (105). The completed PRISMA checklist is shown in Appendix 1.

The eligibility criteria for the articles was described using the PICO framework, a full description of which can be found below in Table 2.1. The “comparison” aspect of the framework was not deemed relevant in the given context.

All study types and those published during any year were considered. Studies published in all languages were empirically considered, pending being able to find a translator for said language. Speakers of all foreign languages were found, so no articles were excluded on these grounds.

Studies were required to contain primary data and be published in writing in full. As such, reviews and conference abstracts were excluded. Theses were also not considered.

Regarding the participant population, studies were required to include children (participants under the age of 18) with type 1 diabetes. Studies that included some adults were not necessarily excluded, as long as inferences could be drawn specifically regarding children. Examples where this may be the case include:

a) Adults were part of the study sample, but results were separated according to age.
b) Adults were part of the study sample, but the mean participant age was below 18.

In terms of an intervention, it was required that participants be receiving insulin therapy. Given that no T1DM patients should ever not be receiving insulin therapy in some form, this part of the criteria was not expected to ever be utilised.

The outcome of interest was factors that affect adherence to insulin therapy. “Factors” could be quantitative (such as demographical correlations to adherence/non-adherence) or qualitative (such as patient-reported reasons for non-adherence/adherence). Studies were required to specifically assess insulin therapy in some way - whether it be through objective measures such as downloading of insulin pump data, or more subjective measures such as self-report questionnaires – but they were not required to separate the components of adherence out in results (i.e.- results being expressed as a composite measure of adherence were acceptable). Studies did not measure insulin adherence and instead inferred adherence by measuring of another aspect of care (such as BGM frequency) were excluded.

PICO	Inclusion Criteria	Exclusion Criteria
Population	• Humans • Children (below the age of 18) • With type 1 diabetes	• Not humans • Adults (people aged 18 and over) o Including papers where some children are included along with adults, but the results are not separated out into adults/children • Do not have type 1 diabetes (including those with any form of diabetes other than type 1, e.g.- type 2 or cystic fibrosis-related)
Intervention	• Insulin treatment	• Not receiving insulin treatment (NB: this aspect of the exclusion criteria should theoretically never be met as every T1DM patient will receive insulin)
Comparison	• N/A	• N/A

Outcomes	• Primary data that relates to:
	  o Adherence to treatment
	  o Non-adherence to treatment
	• Results may show correlations (e.g.- "as children get older their adherence to insulin treatment gets worse") or reasons for adherence/non-adherence (e.g.- "non-compliant children stated that they were fearful of hypos")
		• Any outcome not relevant to insulin treatment adherence
		• Outcomes that infer insulin adherence via measuring a different variable (e.g.- "we measured how often the patients performed blood glucose testing. Patients who measured more often we deemed as being more adherent to treatment.")
		• Outcomes that relate to treatment adherence, but are not from primary data (e.g.- reviews)
		• Outcomes that relate to treatment adherence, but is not published in full (e.g.- conference papers that have not been fully published)

Table 2.1 Inclusion and Exclusion Criteria for determining relevant studies. Legend; T1DM: Type 1 Diabetes, N/A: not applicable, PICO: framework used to construct criteria (Population, Intervention, Comparison and Outcomes.

2.2.2. Identification of Relevant Studies

To improve the chances of finding relevant studies, 5 databases were searched using the Healthcare Databases Advanced Search (HDAS) (106). HDAS is a search engine with access to 9 databases. Each database was researched to determine their predominant area of research and if it was likely to contain relevant studies. Based upon this, 5 of these 9 databases were searched:

- Excerpta Medica Database (EMBASE)
- Healthcare Management Information Consortium (HMIC)
- Medline
- PsychINFO
- PubMed

EMBASE is produced by Elselvier (107) and includes biomedical and pharmacological studies, including 32 million records across 8 500 journals, with the earliest dating to 1947.

HMIC (accessed only through HDAS (106)) is published by the UK Department of Health in association with the Nuffield Institute for Health and the King's Fund Library. It is a combination of the databases of the UK Department of Health's Library and Information Services (DH-Data) and the King's Fund Information and Library Service. It contains 214 000 articles between the two databases, dating back to 1979.

Medline is a component of PubMed, through which it is accessed (108). It contains over 26 million articles from a range of fields including medicine, nursing and pharmacy. Its records date back to 1946.

PsychINFO is produced by the American Psychological Association (APA) (109) and contains over 3.5 million articles, dating back to 1887 from the field of psychology.

PubMed is maintained by the United States National Library of Medicine (108) and has over 30 million articles dating back to 1966 from the fields of life science and biomedicine.

2.2.3. Design of Search Strategy

The search strategy was designed following training from a medical librarian with extensive experience in conducting medical literature searches. It was constructed with the main concepts of

the research question in mind and to maximise the number of potentially relevant results by including synonyms listed within the database thesauruses (MeSH – medical sub-heading – terms, accessed via the "explode" function within HDAS), as well as manually input synonyms added following discussions with experts in paediatrics and paediatric diabetology. The search strategy was largely similar across all databases, with small adjustments to cover potential omissions from each database's in-built thesaurus and to account for the desired age of the population, where this was not part of the in-built search strategy.

The full search strategy can be found in Appendix 10. The core strategy first involved searching for articles relating to T1DM. Synonyms such as "insulin dependent diabetes" and "juvenile onset diabetes" were separated by the Boolean operator OR. The in-built search engine thesaurus specifically used the term "diabetes mellitus", so additional search terms were manually added to exclude "mellitus", to cover for the possibility of articles using the shortened name for the disease. All search terms were included in parentheses to ensure searching for that specific term, as opposed to all articles containing the word "type" and "one" et cetera.

The next step was to begin narrowing the search results by including the term insulin (separated from the first step of the strategy with the Boolean operator AND) followed by including the term "adherence" and its synonym "compliance" (again, separated from the previous steps with the Boolean operator AND). The final step of the strategy was to further refine to only include articles with children as subjects, which was done with each respective database's "limits" function.

Terms relating to study types were not included as not all studies will state their design in their title, abstract or key words.

2.2.4. Selecting Eligible Studies for Inclusion

All of these articles were then screened for eligibility by two independent reviewers (JC and DG). The results were passed through 3 times, first to exclude results based upon their title, then abstract and finally by full text.

If a result was excluded at any stage, the first point of the exclusion criteria that it satisfied was listed.

The two reviewers were required to agree on both the stage of screening that an article was excluded and the reason for exclusion. Any disagreement was first discussed between the reviewers. If a consensus could still not be reached, the article would be independently adjudicated by a third member of the research team (who was a consultant paediatrician and experienced academic - DH).

For the non-English language papers, the role of the second reviewer was fulfilled by the foreign language speaker.

For 1270 of the articles, agreement was already achieved. The remaining 36 were agreed upon after discussion. Adjudication was not required for any of the papers.

2.2.5. Data Extraction

The first reviewer (JC) constructed a data extraction tool in correspondence with an experienced academic and consultant paediatrician (DH) and a consultant paediatric diabetologist (MD). This tool was then used to extract the following information:

- Mean age and duration of diabetes of the participants
- Method of measuring adherence
- Factors checked for association with adherence their effect on adherence
- Significance of the effect and the statistical test used.

The data extraction tool can be seen in full in Appendix 2.

Most study results were expressed as Pearson correlations. Pearson correlations (often abbreviated to “r”) measure the strength of a linear association between two variables and can be expressed as any value between -1 and +1 (110). The closer to -1 or +1 the value is, the stronger the relationship between the two variables, with a negative number indicating a negative relationship and vice versa (110). It is worth noting that Pearson correlation coefficients are not the same as a line of best fit; the Pearson correlation indicates how far all data points are from the line of best fit (110).

In some studies, the size of the effect was illustrated using the beta (β) value. For every change of 1 unit in the predictor variable (for example, age) the outcome coefficient (adherence) changes by the value of β, either up or down, depending on if β is positive or negative (111).

2.2.6. Quality Assessment of Studies

Quality assessments of all English-language studies were performed by the first reviewer (JC). This assessment made it possible to determine if the results were valid and if proper conclusions could be drawn.

Quality assessment of foreign language studies were not performed as all tools used to assess quality were written in English, meaning that they would not necessarily translate appropriately and may lead to misleading comparisons.

A different validated quality assessment tool was used for each study design.

For cross-sectional cohort studies, the Appraisal Tool for Cross-Sectional Studies (AXIS) (112) was used. This tool has 20 questions across 5 domains: introduction, methods, results, discussion and other, with 1, 10, 5, 2 and 2 questions addressing each domain, respectively. All questions can be answered by the reviewer as yes, no or do not know. There is no defined, objective way of scoring the end results, so a total of the answers that would reduce the risk of bias has been added for the purposes of this review, to provide a quick way of comparing the quality of the included studies. For all questions apart from 13 and 19, an answer of “yes” would award 1 point and an answer of “no” would award 0 points. For questions 13 and 19, this was reversed. An answer of “do not know” for any question would award 0 points for that question. Appendix 3 includes the full tool as well as the answers and total score for all included cross-sectional cohort studies.

For case-control and longitudinal cohort studies, the Newcastle-Ottawa Scale (NOS) (113) was used. This system assesses studies across three domains: selection of study participants, comparability of the cohorts and outcome. A star rating system is used, with a possible maximum of 9 stars. The questions for cohort studies and case-control studies differ slightly, but still assess these 3 domains and still award a maximum of 9 stars. The full case-control study tool and responses can be found in Appendix 4 and Appendix 5, respectively. The full cohort study tool and responses can be found in Appendix 6 and Appendix 7, respectively.

For randomised control trials (RCTs), the short version of the Revised Cochrane risk of bias tool for randomised trials (RoB 2) (114) was used. This tool assesses studies across 5 domains:

1. Risk of bias arising from the randomisation process
2. Risk of bias due to deviations from the intended interventions

3. Risk of bias due to missing outcome data
4. Risk of bias in measurement of the outcome
5. Risk of bias in selection of the reported result.

The study is judged in each of these domains as “low risk”, “some concerns” or “high risk”.

The study is then given an overall rating with the same grading:

- Low risk: the study was judged as low risk across all 5 domains
- Some concerns: the study was judged to have some concerns in at least one domain, but was not high risk for any domain
- High risk: the study was judged to be high risk in at least one domain or to have some concerns across multiple domains.

The full tool and assessments for all included RCTs can be found in Appendix 8.

2.2.7. Grading of Evidence

Evidence was graded using the validated GRADE (Grading of Recommendations, Assessment, Development and Evaluations) framework (115).

With this framework, the quality of evidence relating to each of the pre-defined outcomes is assessed and graded as either very low, low, moderate, or high (115). The meanings of each of these terms can be found in Table 2.2.

The methodology of studies provides the starting point for the GRADE rating, with RCTs beginning as “high” and observational studies beginning as “low” (115). The rating can then be moved down according to assessments made to 5 GRADE domains:

1. Risk of bias,
    a. See section 2.2.6 regarding quality assessment of studies
2. Imprecision,
    a. Usually assessed in relation to the 95% confidence interval
3. Inconsistency,
    a. Whether consistent effects are shown across several studies or not
4. Indirectness,

    a. Whether the intervention of interest is occurring with the population of interest, or if assertions are being made based on a different intervention in a different population
5. Publication bias
    a. Requires making inferences about missing evidence to assess if the result of the study/studies influenced the decision to publish it/them (115).

Less frequently, evidence can have its rating increased if there is a large magnitude of effect, a dose-response gradient or if confounding factors would reduce the magnitude of an effect (115).

GRADE Rating	Meaning
Very low	True effect is probably markedly different from the estimated effect.
Low	True effect might be markedly different from the estimated.
Moderate	True effect is probably close to the estimated effect.
High	The authors (of the systematic review) have a lot of confidence that the true effect is similar to the estimated effect.

Table 2.2 Meanings of GRADE ratings. Legend; GRADE: Grading of Recommendations, Assessment, Development and Evaluations. Adapted from (115).

2.2.8. Data Analysis

Thematic analysis was performed on all included studies with each factor checked for association with adherence being sorted in to one of 5 themes:

1. Demographics
   I. E.g.- age, gender and socio-economic status. Duration of diabetes was also placed within this theme as it is an innate, unidirectional characteristic and cannot fluctuate.
2. Past medical history
   I. E.g.- number of hospital admissions.
3. Diabetes management and results
   I. E.g.- insulin regimen, method of insulin delivery, HbA1c.
4. Psycho-social
   I. E.g.- depression, lifestyle factors (such as exercise frequency).
5. Family dynamics.
   I. E.g.- support from family members, family cohesion and conflict.

Factors considered to be related to family dynamics are distinct from psycho-social factors that involve family members. For example, family conflict would be considered to be related to family dynamics, whereas maternal depression would be a psycho-social factor, as how this actually affects the interactions between family members cannot be assumed.

Identification of these 5 themes was done following consultation with a consultant paediatric diabetologist and a clinical psychologist who works with children with diabetes.

3. Results

3.1. Study Selection

1799 studies were identified from the 5 databases using the search criteria, including 483 duplicates, leaving 1306 studies being screened for eligibility based on title or abstract. Of these studies, 1057 were deemed as being ineligible, leaving 249 studies to be screened by full text. 173 of these studies were ineligible, leaving 76 to be included for analysis. Four of these studies did not have an available full text after online searches, contacting the British Library and contacting the study authors, so were excluded for this reason. A list of all of the original 1306 studies can be found in Appendix 9, along with their reasons for exclusion at all stages. Figure 3.1 shows the flowchart illustrating the study selection process.

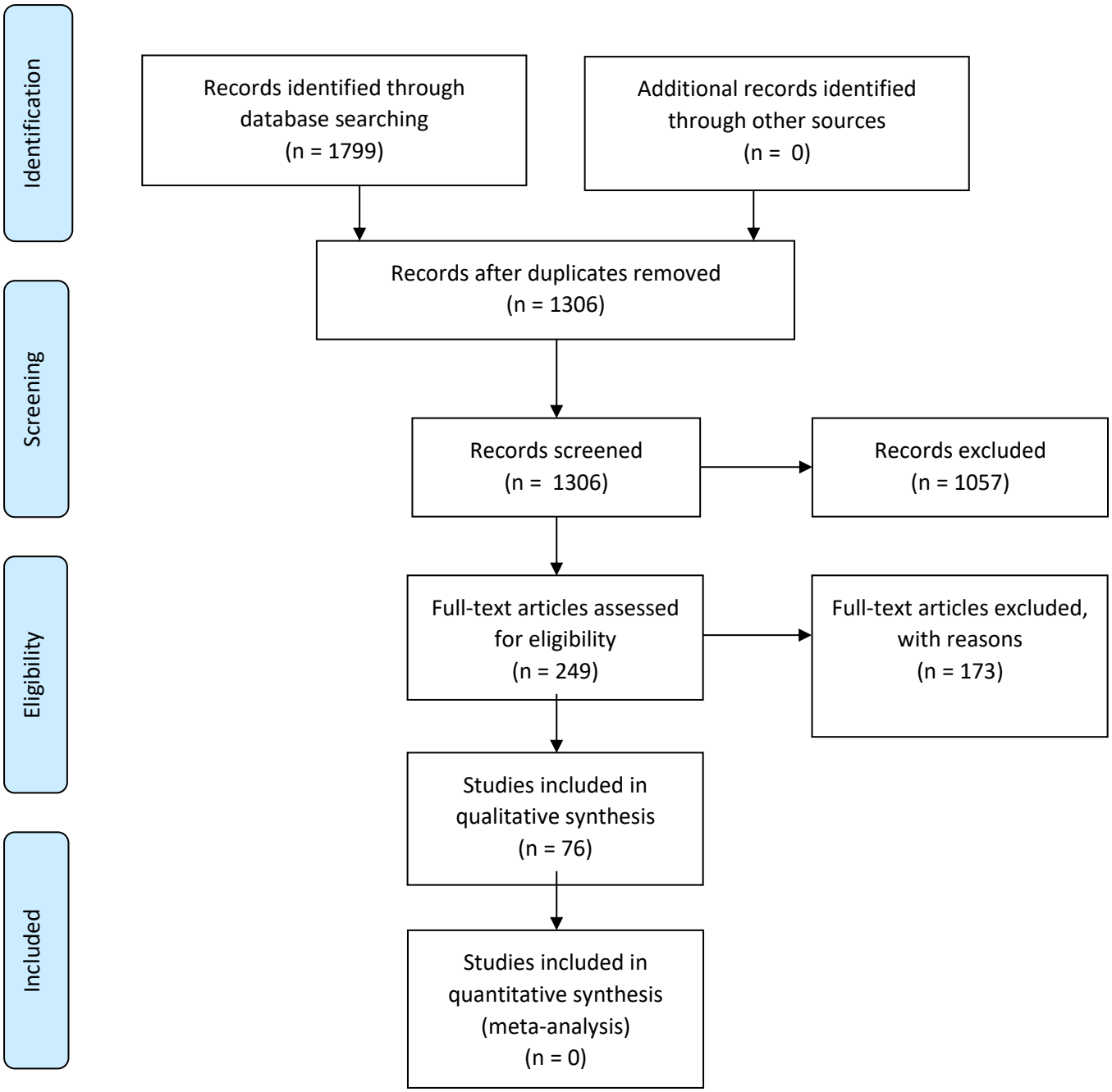

Figure 3.1 Flowchart of study identification process. Legend; n: number of studies.

3.2. Quality of Included Studies

Forty-four cross-sectional studies (116–159) were assessed for quality using the Appraisal Tool for Cross-Sectional Studies (AXIS) (as described in section 2.2.6). The mean score was 16/20 with a range of 13-19. The most common shortcoming of studies was relating to accounting for response bias, with just 7/44 (15.9%) of studies making any attempt to categorise non-responders. The full assessment of each study can be found in Appendix 3.

Two case-control studies (160,161) were assessed for quality using the case-control version of the Newcastle-Ottawa scale. Both of these studies earned the maximum number of 9 stars. The full assessment of both studies with individual answers can be found in Appendix 4.

Eighteen longitudinal cohort studies (162–179) were assessed for quality using the cohort study version of the Newcastle-Ottawa scale (as described in section 2.2.6). The maximum possible score for each study was 9 stars. The mean score (rounded to 1 decimal place) amongst the 18 studies was 6.8 stars with a range of 5-9 stars. The full assessment of each study with individual answers can be found in Appendix 6.

Seven Randomised Control Trials (RCTs) (180–186) were assessed for quality using the revised Cochrane Risk of Bias tool for randomised trials (RoB 2), as described in section 2.2.6. 3/7 (42.9%) of assessed studies were classed as having a high risk of bias, 2/7 (28.6%) as having “some concerns” and 2/7 (28.6%) as having a low risk of bias. The most common cause of a rating of high risk of bias was relating to domain 5: selection of reported result, with 5/7 (71.4%) of studies using multiple outcome measures. The full assessment of each study with individual answers can be found in Appendix 8.

The remaining five studies were foreign language studies and were not assessed.

3.3. Study Characteristics

The 76 included studies took place across 27 countries. The number of studies from each country were as follows: 44/76 (57.9%) from the USA, 4/76 (5.3%) from France, 3/76 (3.9%) from Canada and from across the UK (with a further 2 taking place specifically in Scotland and 1 in England), 2/76 (2.6%) from each of Austria, Denmark, Finland, Japan, the Netherlands and Spain respectively, and

1/76 (1.3%) from each of Australia, Egypt, Germany, Hong Kong, India, Iran, Israel, Kuwait, Malaysia, Norway, Poland, Portugal, Puerto Rico and Saudi Arabia.

For one study, the country where it took place could not be determined. The above numbers total to more than the total number of studies, as some studies took place across multiple countries.

Seventy-one of the included studies were published in English. One was published in French, 2 in Dutch and 2 in Spanish.

A total of 9 969 children and young people were included in all studies, with a mean of 133 children per study and a range of 28 to 1 028.

3.4. Methods of Measuring Adherence

The 76 publications contained 38 different methods of measuring adherence. Note that one of these methods is “questionnaire not otherwise specified”, so is likely composed of more methods. Table 3.1 Different methods of adherence assessment used in the included studies and the number of studies that used them. Table 3.1 lists the different methods used throughout the included studies and the numbers of studies that used each method. 69/76 (90.8%) of studies used 1 method of measuring adherence, 4/76 (5.3%) used 2 methods and 1/76 (1.3%) used 3 methods.

The contents of this table are summarised as a bar chart in Figure 3.2.

Questionnaires were the most common methods of assessing adherence, with 55/76 (72.4%) of the studies using some form of questionnaire either as a part of, or the as entirety of their adherence measure.

One of the most frequently used of the questionnaires was the Diabetes Self-Care Inventory (SCI) (187), with 10 of the studies using either the original questionnaire (183), the revised version (SCI-R) (128) (188), or creating their own questionnaire (173) based on the SCI. All versions of the SCI are self-reports on the patient’s perspective of their adherence to specific management tasks over the previous 1-2 months, asking them to grade each item from “never do it” to “always do this as recommended, without fail” (188). The original SCI contained 14 items that assessed adherence to blood glucose monitoring, insulin treatment, diet, exercise, and emergency precaution guidelines

(187). The SCI-R covered the same areas of adherence, but wording was updated to reflect the current practice recommendations and improve the efficiency of completion and clarity (188). Table 3.2 contains details of the changes that were made to items. Additionally, the response of "not applicable or N/A" was removed as an option from all items except those relating to ketones, insulin and pills; this is because the questionnaire is designed to be used by both patients with T1DM and T2DM and as such, items relating to these themes will not always be relevant (188).

The final result of the changes is a 15-item questionnaire consisting of:

- 4 regarding diet
- 3 regarding medication administration
- 3 regarding preventative measures/routine aspects of care
- 2 regarding glucose monitoring
- 2 regarding hypoglycaemia
- 1 regarding exercise (188).

The final score is calculated averaging the scores and converting to a 0-100-point scale, where higher scores indicate better adherence (188).

One of the few objective measures used to measure adherence was Medication Possession Ratio (MPR) (166) (167). This is calculated by dividing the number of days' supply of a medication in a given period by the number of days that has elapsed between prescription collections (189). The ratio is always a positive number (including 0), with 0 being complete non-adherence (where no prescriptions have been collected) and 1 being perfect adherence (189). It is possible to get a number greater than one, if the patient has collected their prescription too early. This could infer medication overdosing but could also be a result of practical reasons such as lost medication, or changes in management (189).

The other objective measures are downloaded insulin pump data and BOLUS scores (138) (121). The length of time that can be assessed depends on the model of insulin pump, as does the data that can be collected from it. For example, the Medtronic pump (31) can store 2-3 months of data and captures carbohydrate inputs and doses of delivered insulin boluses, as well as blood glucose information by virtue of being an integrated pump (138). Other pumps such as the Omnipod (32) are not integrated with a CGM and as such cannot capture blood glucose data (190).

BOLUS scores range between 0-3, with 0 being the worst adherence and 3 being the best adherence (191). They are calculated by looking at the previous 14 days of downloaded insulin pump data: a point is awarded for any food-related bolus occurring at breakfast (6-10am), lunch (11am-3pm) and dinner (4-10pm), with a maximum of one point available at each time period (191). A mean of the 2 weeks of scores are then taken to give the final BOLUS score (191). Studies have shown that BOLUS scores are more closely associated with glycaemic control than frequency of SMBG, which was the standard objective diabetes adherence measure for many years (191).

Method of adherence assessment	Number of studies
Questionnaire (not otherwise specified)	11
Self-Care Inventory/Revised Self-Care Inventory (SCI/SCI-R; La Greca, 1994, 2004))	7
Downloaded pump data/BOLUS scores	7
Non-specified interviews	6
Barriers to Adherence Questionnaire	4
Diabetes Self-Management Profile (DSMP; Harris et al., 2000)	4
Questionnaire by Cerkoney and Hart, 1980	3
Diabetes Regimen Adherence Questionnaire (DRAQ)	2
Healthcare provider ratings	2
Interview by Hanson et al., 1992	2
Medication Possession Ratio (MPR)	2
Observation of injection technique	2
Questionnaire by Jacobson et al., 1987	2
Summary of Self-Care Activities Questionnaire	2
Adherence and IDDM Interview (Hanson et al., 1987)	1
Adherence in Diabetes Questionnaire (ADQ)	1
Child Eating Disorder Examination (ChEDE) version 12.0	1
Diabetes Adaptation Scale	1
Diabetes Family Responsibility Questionnaire (DFRQ)	1
Diabetes Management Questionnaire	1
Diabetes Self-Management Interview	1
General Self-Efficacy Scale	1
Insulin Adjustment Score	1
Insulin Required of Adherence Scale	1
Management Behaviours of Adolescents (Harris et al., 2000 and La Greca, 1995)	1
Paediatric Quality of Life Questionnaire (PedsQL)	1
Participant diaries	1
Problem Areas in Diabetes Questionnaire (PAID)	1
Questionnaire by Littlefield et al. 1992	1
Questionnaire on injection site rotation	1
Reported Adherence to Medication Scale (Horne, 1999)	1
Self-Care Questionnaire (Glasgow et al., 1987)	1
Diabetes Self-Care Inventory (DSCI; Kanematsu, 1997)	1
Self-Efficacy for Diabetes Questionnaire (SED)	1
Self-Report Questionnaire on Adherence (Almeida and Pereira, 2003)	1
Summary of Self-Care Activities Questionnaire (Schafer et al., 1983)	1

Table 3.1 Different methods of adherence assessment used in the included studies and the number of studies that used them. SCI: Self-Care Inventory, SCI-R: Revised Self-Care Inventory, DSMP: Diabetes Self-Management Profile, DRAQ: Diabetes Regimen Adherence Questionnaire, MPR: Medication Possession Ratio, IDDM: Insulin Dependent Diabetes Mellitus, ChEDE: Child Health Eating Disorder Examination, DFRQ: Diabetes Family Responsibility Questionnaire, PedsQL: Paediatric Quality of Life Questionnaire, PAID: Problem Areas in Diabetes Questionnaire, SED: Self-Efficacy for Diabetes Questionnaire, DSCI: Diabetes Self-Care Inventory.

Item(s) in SCI	Change Made	Item in SCI-R
“eat meals on time” and “eat snacks on time”	Items combined	“eat meals/snacks on time“
“exercise strenuously”	Item removed	N/A
“testing blood glucose”	Wording changed	“check blood glucose with monitor”
“recording ketones”	Wording changed	“check ketones when blood glucose level is high”
N/A	Item added	“keeping food records”
N/A	Item added	“reading food labels”
N/A	Item added	“treating low blood glucose”

Table 3.2 Changes made to the SCI to create the SCI-R. Legend; SCI: Self-Care Inventory, SCI-R: Revised Self-Care Inventory, N/A: not applicable. Adapted from (187,188).

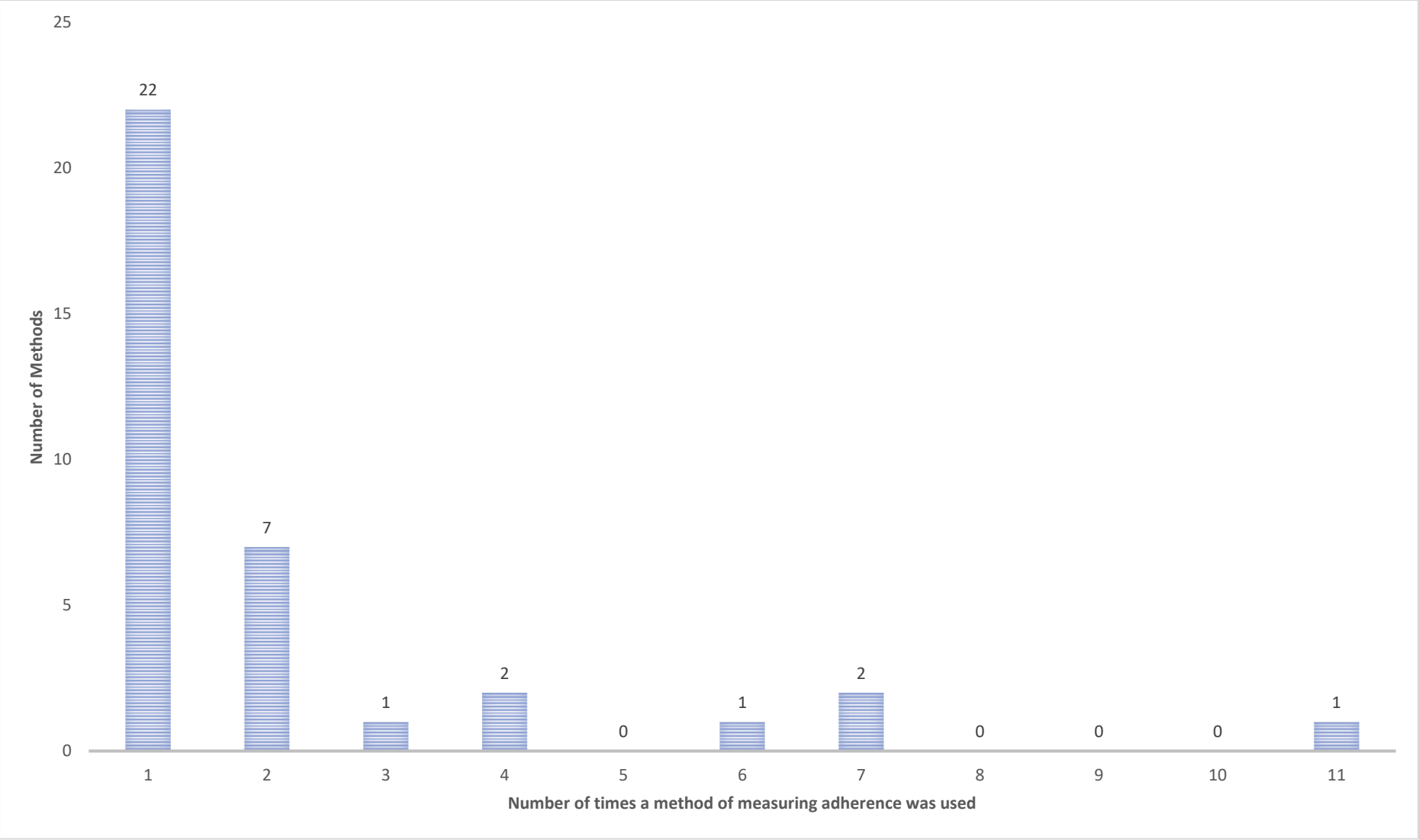

Figure 3.2 Graph showing the heterogeneity of methods used to assess adherence. Note that the "method used 10 times" was "questionnaire not otherwise specified", so is likely composed of many different questionnaires.

3.5. Range of Factors Assessed and Themes

Across the included studies there were 236 factors checked for association with adherence.

Factor Checked for Association with Adherence	Number of Studies Assessing this Factor	Theme
Age	33	Demographics
HbA1c/Glycaemic control	20	Diabetes management
Duration of diabetes	19	Demographics
Gender	15	Demographics
Family conflict	8	Family dynamics
Depression	7	Psycho-social
Self-Efficacy*	7	Psycho-social
Support from family	7	Family dynamics
Cohesion	5	Family dynamics
Diabetes knowledge	4	Diabetes management
Exercise frequency	4	Psycho-social
Child's increasing responsibility	3	Family dynamics
CSII vs MDI	3	Diabetes management
Household income	3	Demographics
Patient perceptions of family organisation	3	Family dynamics
Socio-economic status	3	Demographics
Stress	3	Psycho-social
Better parent-child relationship	2	Family dynamics
BGM frequency	2	Diabetes management
BMI SDS	2	Past medical history
Caregiver education level	2	Demographics
Diabetes adjustment	2	Psycho-social
Family stress	2	Psycho-social
Frequency of alcohol consumption	2	Psycho-social
Perceived impact	2	Psycho-social
Perceived threat	2	Psycho-social
Single parent household vs both parents	2	Family dynamics
Smoking frequency	2	Psycho-social
Social competence	2	Psycho-social
"Sweet talk" text message intervention	1	Psycho-social
Acceptance	1	Psycho-social
Achievement striving	1	Psycho-social
Activity level	1	Psycho-social
ADHD	1	Psycho-social
Adjustment disorder	1	Psycho-social
Adolescent diabetes technology index	1	Diabetes management
Adventurousness	1	Psycho-social
Agoraphobia	1	Psycho-social

Agreeableness	1	Psycho-social
Alcohol/drug abuse	1	Psycho-social
Altruism	1	Psycho-social
Amount of sleep	1	Psycho-social
Anger	1	Psycho-social
Anxiety	1	Psycho-social
Any psychiatric disorder	1	Psycho-social
Artistic interests	1	Psycho-social
Assertiveness	1	Psycho-social
Attitude	1	Psycho-social
Authoritarian family function	1	Family dynamics
Barriers to adherence	1	Psycho-social
Behavioural support	1	Family dynamics
Benefits - costs	1	Psycho-social
Binging	1	Psycho-social
Boluses delivered day before clinic visit (designed to assess white coat adherence)	1	Diabetes management
Cautiousness	1	Psycho-social
Cheerfulness	1	Psycho-social
Child's executive functioning	1	Psycho-social
Clinical/subclinical eating disorders	1	Psycho-social
Communication	1	Psycho-social
Compliance in the first 9 months' association with compliance in the second 9 months	1	Diabetes management
Conduct disorder	1	Psycho-social
Conscientiousness	1	Psycho-social
Consequences	1	Psycho-social
Control group vs intervention (trained by professionals who received a communication training plan) group	1	Psycho-social
Co-operation	1	Psycho-social
Coping measures: ego defense level	1	Psycho-social
Cues	1	Psycho-social
Cure-control	1	Psycho-social
Diabetes monitoring	1	Diabetes management
Diabetes Social Support Questionnaire: frequency	1	Psycho-social
Diabetes Social Support Questionnaire: individualised	1	Psycho-social
Discipline	1	Psycho-social
DSMP hypoglycaemia subscale: diet	1	Diabetes management
DSMP subscale: glucose testing	1	Diabetes management
DSMP subscale: hypoglycaemia management	1	Diabetes management
Dutifulness	1	Psycho-social
Dysthymia	1	Psycho-social
Eating Attitudes Test 26	1	Psycho-social
Eating disorders (clinical/subclinical)	1	Psycho-social

Eating Disorders Inventory - Body Dissatisfaction Scale	1	Psycho-social
Education group vs positive affect (PA) text message group	1	Psycho-social
Education intervention	1	Psycho-social
Emergency (hypoglycaemia) precautions	1	Diabetes management
Emotional adjustment	1	Psycho-social
Emotionality	1	Psycho-social
Energy and willpower	1	Psycho-social
Excitement seeking	1	Psycho-social
Experience of results	1	Psycho-social
Expressiveness	1	Psycho-social
Externalising behaviour	1	Psycho-social
Extraversion	1	Psycho-social
Family relations	1	Family dynamics
Family support: affective	1	Family dynamics
Family support: control	1	Family dynamics
Family support: indirect	1	Family dynamics
Family support: no support	1	Family dynamics
Father negative	1	Family dynamics
Father-absent vs father-present	1	Family dynamics
Feel that diabetes affects their mental wellbeing	1	Psycho-social
Feel that diabetes affects their physical wellbeing	1	Psycho-social
Feel that they have support from nurses	1	Psycho-social
Feel that they have support from their physician	1	Psycho-social
Frequency of breakfast	1	Psycho-social
Frequency of dinner	1	Psycho-social
Frequency of evening snack	1	Psycho-social
Frequency of help	1	Psycho-social
Frequency of lunch	1	Psycho-social
Frequency of mid-afternoon snack	1	Psycho-social
Frequency of mid-morning snack	1	Psycho-social
Friendliness	1	Psycho-social
Functional enuresis	1	Psycho-social
General monitoring	1	Psycho-social
Generalised anxiety disorder	1	Psycho-social
Gregariousness	1	Psycho-social
HBM: Benefits	1	Psycho-social
HBM: costs	1	Psycho-social
HBM: cues to action	1	Psycho-social
HBM: Susceptibility	1	Psycho-social
Health Belief Model (HBM): Severity	1	Psycho-social
HFS: Behaviour	1	Psycho-social
HFS: worry/fear	1	Psycho-social
Identity	1	Psycho-social
Imagination	1	Psycho-social
Immigrant vs French Native mother: General insulin adherence	1	Demographics

Immigrant vs French Native mother: Percentage that adjust insulin dose during illness	1	Demographics
Impulsiveness	1	Psycho-social
Increased disease severity	1	Past medical history
Increased severity of risks	1	Psycho-social
Increased treatment complexity	1	Diabetes management
Increased vulnerability to risks	1	Psycho-social
Increasing lack of responsibility from mother or child	1	Family dynamics
Independence	1	Psycho-social
Independence and encouragement	1	Psycho-social
Insulin dosage calculator use: control group (manual calculations)	1	Diabetes management
Insulin dosage calculator use regularity	1	Diabetes management
Intellect	1	Psycho-social
Intensity of insulin regimen (2 vs 4 injections per day)	1	Diabetes management
Internalising behaviour	1	Psycho-social
Intervention group (12 play sessions) vs control group	1	Psycho-social
Intervention group (monthly diabetes education session) vs control group	1	Diabetes management
Intrusive support	1	Psycho-social
Liberalism	1	Psycho-social
Locus of control (internal/external etc.)	1	Psycho-social
Maternal Involvement	1	Family dynamics
Mean daily blood glucose	1	Diabetes management
Mean diabetes-specific stress (DSS) severity	1	Psycho-social
Method of insulin delivery	1	Diabetes management
Modesty	1	Psycho-social
Morality	1	Psycho-social
Mother negative	1	Family dynamics
Mother report of social functioning	1	Psycho-social
Mother's age	1	Demographics
Mother's education	1	Demographics
Mother's increasing responsibility for management of daily regimen tasks	1	Family dynamics
Mother's increasing responsibility for management of general health	1	Family dynamics
Mother's increasing responsibility for social presentation (talking to family and friends about disease etc.)	1	Family dynamics
Mother's sense of empowerment	1	Psycho-social
Motivation level	1	Psycho-social
Negative communication	1	Psycho-social
Negotiated Telephone Support	1	Psycho-social

Negotiated Telephone Support, yearly clinical review, 3-monthly measurement of HbA1c	1	Diabetes management
Neuroticism	1	Psycho-social
Non-supportive family	1	Family dynamics
Non-white adolescent	1	Demographics
Number of adverse life events	1	Psycho-social
Number of children in family	1	Family dynamics
Number of hospital admissions	1	Past medical history
OCD	1	Psycho-social
Openness to experience	1	Psycho-social
Oppositional defiant disorder	1	Psycho-social
Orderliness	1	Psycho-social
Overall QoL	1	Psycho-social
Parent perception of child's independence	1	Family dynamics
Parent perception of control	1	Psycho-social
Parent perception of family organisation	1	Family dynamics
Parental marital status	1	Family dynamics
Parents' health literacy	1	Psycho-social
Parents perceptions of expressiveness	1	Psycho-social
Parents' reading comprehension	1	Psycho-social
Patient perception of control	1	Psycho-social
Patient perception of independence	1	Family dynamics
Patient perceptions of expressiveness	1	Psycho-social
Perceived competence	1	Psycho-social
Perceived level of hope	1	Psycho-social
Presence of co-morbidities	1	Past medical history
Presence of threat to emotional well-being	1	Psycho-social
Presence of threat to physical well-being	1	Psycho-social
Presence of threat to social wellbeing	1	Psycho-social
Psychosis	1	Psycho-social
PTSD	1	Psycho-social
PTSD diagnosis of mother	1	Psycho-social
QoL (with number of injections per day)	1	Psycho-social
QoL: Diabetes worry	1	Psycho-social
QoL: Satisfaction	1	Psycho-social
QoL: Social worry	1	Psycho-social
Race	1	Demographics
Recent change in insulin dose	1	Diabetes management
Regular Use of I-Port	1	Diabetes management
Report of symptom severity	1	Diabetes management
Response costs	1	Psycho-social
Response efficacy	1	Psycho-social
School/work performance	1	Psycho-social
Self-consciousness	1	Psycho-social
Self-discipline	1	Psycho-social

Self-report on adherence to BGM	1	Diabetes management
Self-report on adherence to meals	1	Diabetes management
Self-report on adherence to snacks	1	Diabetes management
Sense of normality	1	Psycho-social
Separation anxiety disorder	1	Psycho-social
Sociability scores	1	Psycho-social
Social anxiety	1	Psycho-social
Social phobia	1	Psycho-social
Specific (isolated) phobias	1	Psycho-social
Support from friends	1	Psycho-social
Support from nurses	1	Psycho-social
Support from physicians	1	Psycho-social
Sympathy	1	Psycho-social
Teacher victimisation	1	Psycho-social
Threat	1	Psycho-social
Timeline	1	Psycho-social
Total DSMP score	1	Diabetes management
Total HFS	1	Diabetes management
Total meals	1	Psycho-social
Treatment effectiveness: control	1	Psycho-social
Treatment effectiveness: prevent	1	Psycho-social
Trust	1	Psycho-social
Type of insulin pen	1	Diabetes management
Uses diabetes apps	1	Diabetes management
Uses diabetes websites	1	Diabetes management
Uses meter/pump software	1	Diabetes management
Uses social networking	1	Psycho-social
Uses text messaging	1	Psycho-social
Utilising personal and interpersonal resources coping strategy	1	Psycho-social
Ventilation and avoidance coping strategy	1	Psycho-social
Vulnerability	1	Psycho-social
Warmth from family	1	Family dynamics

Table 3.3 lists these factors, the number of studies that assessed them and the associated theme for thematic analysis (see section 4). A bar chart summarising the results of this table can be found in Figure 3.3.

Factor Checked for Association with Adherence	Number of Studies Assessing this Factor	Theme
Age	33	Demographics
HbA1c/Glycaemic control	20	Diabetes management
Duration of diabetes	19	Demographics
Gender	15	Demographics
Family conflict	8	Family dynamics
Depression	7	Psycho-social
Self-Efficacy*	7	Psycho-social
Support from family	7	Family dynamics
Cohesion	5	Family dynamics
Diabetes knowledge	4	Diabetes management
Exercise frequency	4	Psycho-social
Child's increasing responsibility	3	Family dynamics
CSII vs MDI	3	Diabetes management
Household income	3	Demographics
Patient perceptions of family organisation	3	Family dynamics
Socio-economic status	3	Demographics
Stress	3	Psycho-social
Better parent-child relationship	2	Family dynamics
BGM frequency	2	Diabetes management
BMI SDS	2	Past medical history
Caregiver education level	2	Demographics
Diabetes adjustment	2	Psycho-social
Family stress	2	Psycho-social
Frequency of alcohol consumption	2	Psycho-social
Perceived impact	2	Psycho-social
Perceived threat	2	Psycho-social
Single parent household vs both parents	2	Family dynamics
Smoking frequency	2	Psycho-social
Social competence	2	Psycho-social
"Sweet talk" text message intervention	1	Psycho-social
Acceptance	1	Psycho-social
Achievement striving	1	Psycho-social
Activity level	1	Psycho-social
ADHD	1	Psycho-social
Adjustment disorder	1	Psycho-social
Adolescent diabetes technology index	1	Diabetes management
Adventurousness	1	Psycho-social
Agoraphobia	1	Psycho-social
Agreeableness	1	Psycho-social
Alcohol/drug abuse	1	Psycho-social
Altruism	1	Psycho-social
Amount of sleep	1	Psycho-social

Anger	1	Psycho-social
Anxiety	1	Psycho-social
Any psychiatric disorder	1	Psycho-social
Artistic interests	1	Psycho-social
Assertiveness	1	Psycho-social
Attitude	1	Psycho-social
Authoritarian family function	1	Family dynamics
Barriers to adherence	1	Psycho-social
Behavioural support	1	Family dynamics
Benefits - costs	1	Psycho-social
Binging	1	Psycho-social
Boluses delivered day before clinic visit (designed to assess white coat adherence)	1	Diabetes management
Cautiousness	1	Psycho-social
Cheerfulness	1	Psycho-social
Child's executive functioning	1	Psycho-social
Clinical/subclinical eating disorders	1	Psycho-social
Communication	1	Psycho-social
Compliance in the first 9 months' association with compliance in the second 9 months	1	Diabetes management
Conduct disorder	1	Psycho-social
Conscientiousness	1	Psycho-social
Consequences	1	Psycho-social
Control group vs intervention (trained by professionals who received a communication training plan) group	1	Psycho-social
Co-operation	1	Psycho-social
Coping measures: ego defense level	1	Psycho-social
Cues	1	Psycho-social
Cure-control	1	Psycho-social
Diabetes monitoring	1	Diabetes management
Diabetes Social Support Questionnaire: frequency	1	Psycho-social
Diabetes Social Support Questionnaire: individualised	1	Psycho-social
Discipline	1	Psycho-social
DSMP hypoglycaemia subscale: diet	1	Diabetes management
DSMP subscale: glucose testing	1	Diabetes management
DSMP subscale: hypoglycaemia management	1	Diabetes management
Dutifulness	1	Psycho-social
Dysthymia	1	Psycho-social
Eating Attitudes Test 26	1	Psycho-social
Eating disorders (clinical/subclinical)	1	Psycho-social
Eating Disorders Inventory - Body Dissatisfaction Scale	1	Psycho-social
Education group vs positive affect (PA) text message group	1	Psycho-social

Education intervention	1	Psycho-social
Emergency (hypoglycaemia) precautions	1	Diabetes management
Emotional adjustment	1	Psycho-social
Emotionality	1	Psycho-social
Energy and willpower	1	Psycho-social
Excitement seeking	1	Psycho-social
Experience of results	1	Psycho-social
Expressiveness	1	Psycho-social
Externalising behaviour	1	Psycho-social
Extraversion	1	Psycho-social
Family relations	1	Family dynamics
Family support: affective	1	Family dynamics
Family support: control	1	Family dynamics
Family support: indirect	1	Family dynamics
Family support: no support	1	Family dynamics
Father negative	1	Family dynamics
Father-absent vs father-present	1	Family dynamics
Feel that diabetes affects their mental wellbeing	1	Psycho-social
Feel that diabetes affects their physical wellbeing	1	Psycho-social
Feel that they have support from nurses	1	Psycho-social
Feel that they have support from their physician	1	Psycho-social
Frequency of breakfast	1	Psycho-social
Frequency of dinner	1	Psycho-social
Frequency of evening snack	1	Psycho-social
Frequency of help	1	Psycho-social
Frequency of lunch	1	Psycho-social
Frequency of mid-afternoon snack	1	Psycho-social
Frequency of mid-morning snack	1	Psycho-social
Friendliness	1	Psycho-social
Functional enuresis	1	Psycho-social
General monitoring	1	Psycho-social
Generalised anxiety disorder	1	Psycho-social
Gregariousness	1	Psycho-social
HBM: Benefits	1	Psycho-social
HBM: costs	1	Psycho-social
HBM: cues to action	1	Psycho-social
HBM: Susceptibility	1	Psycho-social
Health Belief Model (HBM): Severity	1	Psycho-social
HFS: Behaviour	1	Psycho-social
HFS: worry/fear	1	Psycho-social
Identity	1	Psycho-social
Imagination	1	Psycho-social
Immigrant vs French Native mother: General insulin adherence	1	Demographics
Immigrant vs French Native mother: Percentage that adjust insulin dose during illness	1	Demographics
Impulsiveness	1	Psycho-social
Increased disease severity	1	Past medical history

Increased severity of risks	1	Psycho-social
Increased treatment complexity	1	Diabetes management
Increased vulnerability to risks	1	Psycho-social
Increasing lack of responsibility from mother or child	1	Family dynamics
Independence	1	Psycho-social
Independence and encouragement	1	Psycho-social
Insulin dosage calculator use: control group (manual calculations)	1	Diabetes management
Insulin dosage calculator use regularity	1	Diabetes management
Intellect	1	Psycho-social
Intensity of insulin regimen (2 vs 4 injections per day)	1	Diabetes management
Internalising behaviour	1	Psycho-social
Intervention group (12 play sessions) vs control group	1	Psycho-social
Intervention group (monthly diabetes education session) vs control group	1	Diabetes management
Intrusive support	1	Psycho-social
Liberalism	1	Psycho-social
Locus of control (internal/external etc.)	1	Psycho-social
Maternal Involvement	1	Family dynamics
Mean daily blood glucose	1	Diabetes management
Mean diabetes-specific stress (DSS) severity	1	Psycho-social
Method of insulin delivery	1	Diabetes management
Modesty	1	Psycho-social
Morality	1	Psycho-social
Mother negative	1	Family dynamics
Mother report of social functioning	1	Psycho-social
Mother's age	1	Demographics
Mother's education	1	Demographics
Mother's increasing responsibility for management of daily regimen tasks	1	Family dynamics
Mother's increasing responsibility for management of general health	1	Family dynamics
Mother's increasing responsibility for social presentation (talking to family and friends about disease etc.)	1	Family dynamics
Mother's sense of empowerment	1	Psycho-social
Motivation level	1	Psycho-social
Negative communication	1	Psycho-social
Negotiated Telephone Support	1	Psycho-social
Negotiated Telephone Support, yearly clinical review, 3-monthly measurement of HbA1c	1	Diabetes management
Neuroticism	1	Psycho-social
Non-supportive family	1	Family dynamics
Non-white adolescent	1	Demographics

Number of adverse life events	1	Psycho-social
Number of children in family	1	Family dynamics
Number of hospital admissions	1	Past medical history
OCD	1	Psycho-social
Openness to experience	1	Psycho-social
Oppositional defiant disorder	1	Psycho-social
Orderliness	1	Psycho-social
Overall QoL	1	Psycho-social
Parent perception of child's independence	1	Family dynamics
Parent perception of control	1	Psycho-social
Parent perception of family organisation	1	Family dynamics
Parental marital status	1	Family dynamics
Parents' health literacy	1	Psycho-social
Parents perceptions of expressiveness	1	Psycho-social
Parents' reading comprehension	1	Psycho-social
Patient perception of control	1	Psycho-social
Patient perception of independence	1	Family dynamics
Patient perceptions of expressiveness	1	Psycho-social
Perceived competence	1	Psycho-social
Perceived level of hope	1	Psycho-social
Presence of co-morbidities	1	Past medical history
Presence of threat to emotional well-being	1	Psycho-social
Presence of threat to physical well-being	1	Psycho-social
Presence of threat to social wellbeing	1	Psycho-social
Psychosis	1	Psycho-social
PTSD	1	Psycho-social
PTSD diagnosis of mother	1	Psycho-social
QoL (with number of injections per day)	1	Psycho-social
QoL: Diabetes worry	1	Psycho-social
QoL: Satisfaction	1	Psycho-social
QoL: Social worry	1	Psycho-social
Race	1	Demographics
Recent change in insulin dose	1	Diabetes management
Regular Use of I-Port	1	Diabetes management
Report of symptom severity	1	Diabetes management
Response costs	1	Psycho-social
Response efficacy	1	Psycho-social
School/work performance	1	Psycho-social
Self-consciousness	1	Psycho-social
Self-discipline	1	Psycho-social
Self-report on adherence to BGM	1	Diabetes management
Self-report on adherence to meals	1	Diabetes management

Self-report on adherence to snacks	1	Diabetes management
Sense of normality	1	Psycho-social
Separation anxiety disorder	1	Psycho-social
Sociability scores	1	Psycho-social
Social anxiety	1	Psycho-social
Social phobia	1	Psycho-social
Specific (isolated) phobias	1	Psycho-social
Support from friends	1	Psycho-social
Support from nurses	1	Psycho-social
Support from physicians	1	Psycho-social
Sympathy	1	Psycho-social
Teacher victimisation	1	Psycho-social
Threat	1	Psycho-social
Timeline	1	Psycho-social
Total DSMP score	1	Diabetes management
Total HFS	1	Diabetes management
Total meals	1	Psycho-social
Treatment effectiveness: control	1	Psycho-social
Treatment effectiveness: prevent	1	Psycho-social
Trust	1	Psycho-social
Type of insulin pen	1	Diabetes management
Uses diabetes apps	1	Diabetes management
Uses diabetes websites	1	Diabetes management
Uses meter/pump software	1	Diabetes management
Uses social networking	1	Psycho-social
Uses text messaging	1	Psycho-social
Utilising personal and interpersonal resources coping strategy	1	Psycho-social
Ventilation and avoidance coping strategy	1	Psycho-social
Vulnerability	1	Psycho-social
Warmth from family	1	Family dynamics

*Table 3.3 List of factors checked for association for adherence and the number of studies that assessed them. Legend; DSMP: Diabetes Self-Management Profile, QoL: Quality of Life, DSS: Diabetes Social Support questionnaire, ADHD: Attention Deficit Hyperactivity Disorder, OCD: Obsessive Compulsive Disorder, PTSD: Post-Traumatic Stress Disorder, HbA1c: glycated haemoglobin, BMI: Body Mass Index, RCT: Randomised Control Trial, BGM: Blood Glucose Monitoring, GAD: Generalised Anxiety Disorder. *Self-efficacy refers to the ability of the child/young person to complete a range of diabetes management tasks, as perceived by the child/young person.*

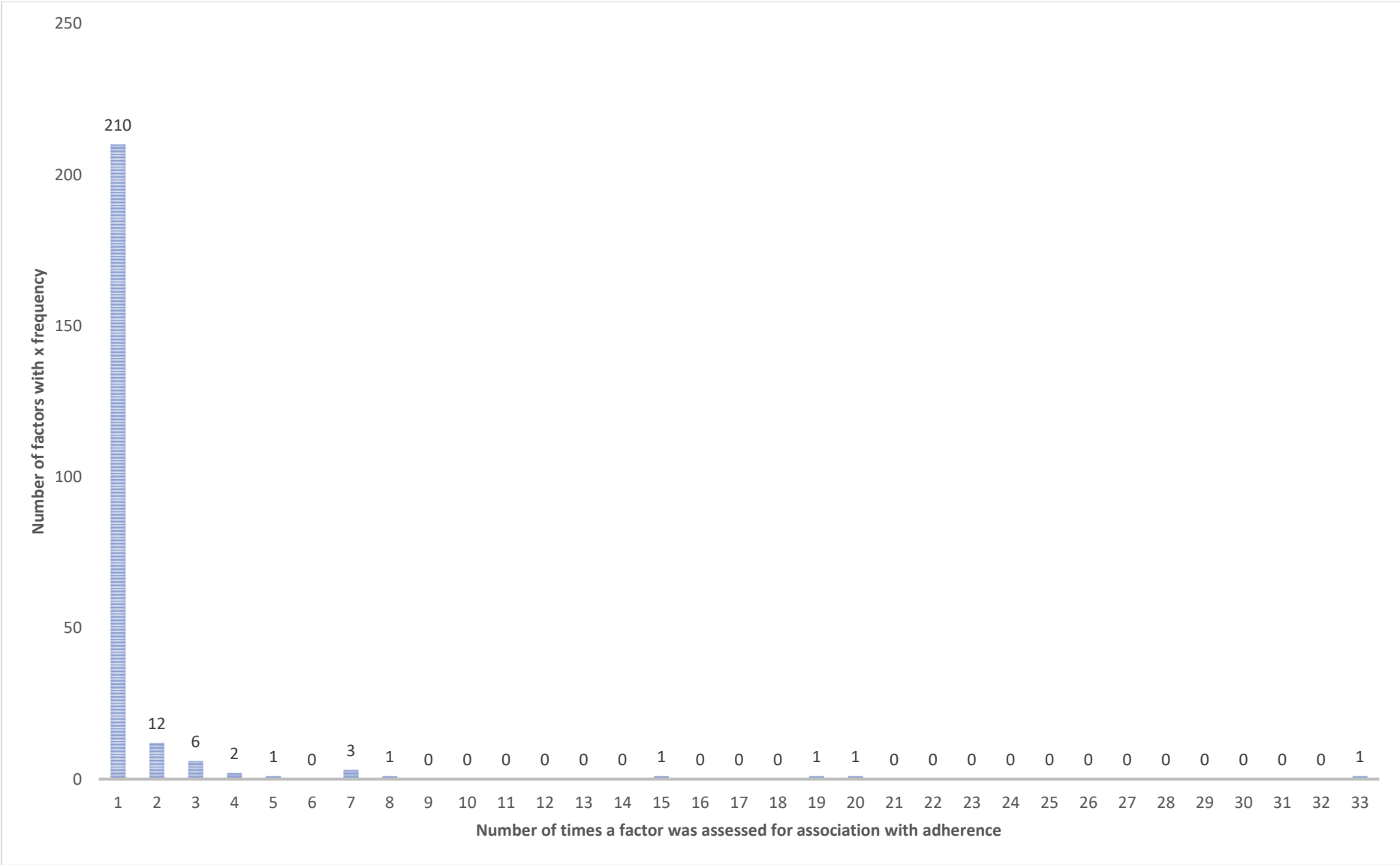

Figure 3.3 Graph showing the heterogeneity of factors assessed for adherence. One factor was assessed in 32 studies while 158 factors were assessed in just 1 study.

3.6. Primary Outcome: Factors Affecting Adherence to Insulin Therapy

In the majority of cases, effects upon adherence were calculated using regression analysis with the strength of the relationship being expressed as Pearson correlations (r). Some studies also quantified the size of the effect using beta (β) values.

For Pearson correlation coefficients (r) and beta values (β), a positive value can be interpreted that adherence improved with the assessed factor and a negative value that adherence worsened with the assessed factor, unless otherwise specified.

If results are not published using Pearson correlations and/or β values, this will be explained alongside the result.

Due to the heterogeneity of the studies involved, as a result of the large number of different methods used to assess adherence and the different factors that were assessed for correlation with adherence, meta-analysis of the studies was not possible.

Due to the large number of factors that were only assessed by 1 study, only factors that were assessed by 4 or more studies have been discussed in detail below. A briefer summary of the remaining studies and factors can be found in Table 3.15.

3.6.1. Age

Thirty-three studies (116,122,123,125,128,132–134,136–138,140,143–145,148,150,151,153,154,156,158,160,163,165–169,177,178,192,193) examined the effect of age upon treatment adherence. These studies are summarised in Table 3.4. To allow for a quick visual estimate of the overall message of the results, the “effect on adherence” column is coloured orange with significant results that suggest adherence worsens with age, and coloured green with significant results that suggest adherence improves with age. Results that are not statistically significant have been left white.

The studies contained a total of 6 134 children and young people with an average of 192 children per study and a range of 31 to 2011. Almost half (3 039/6 134; 49.4%) of these participants came from just two studies.

The 33 studies used 23 different methods of measuring adherence.

24/33 (73%) of these studies (122,123,125,132–134,136–138,140,143–145,151,153,158,163,166–169,177,178,192) had results showing a significant effect for age in at least one of their methods of measuring adherence.

All but two (66.66% of studies) (128) (193) of the papers with statistically significant results suggested that adherence became worse with age in childhood. In addition to demonstrating worsening adherence with advancing age through childhood, two studies (167,178) found that adherence begins to improve once participants exited adolescence into adulthood.

One study (126) found that the strength of the correlation (r) between age and adherence was negative and statistically significant, but that when looking at the size of the effect (β), this was not statistically significant.

The weighted mean (mean of means, taking into account sample size) of the two papers showing adherence improves with age was 11.4 years and the weighted mean of the papers (where both mean age and sample size was known) showing that adherence worsens with age was 13.4 years.

Seven of the studies used an objective measure of adherence (132,138,143,151,165–167), with the remaining 25 studies using a subjective measure; the majority of these were self-report measures, though one (178) had the participant's healthcare providers rating the adherence of the participant.

Of the studies that used objective measures to measure adherence, 2 used BOLUS scores (132,165), 2 used MPR (166,167) (with one of these (166) also using HbA1c and 3 used data retrospectively taken from insulin pumps (137,138,143). Note that BOLUS scores do require retrieving data from insulin pumps, but convert this data into a standardised score, so cannot be considered to be the same thing. Of the 2 studies that used MPR, each study expressed their results differently, with 1 (167) giving the individual scores for each group and the other (166) using Pearson scores. The heterogeneity of the methods of assessing and reporting adherence makes meta-analysis difficult. Just two studies (137,138) used the same method of measuring and reporting adherence (retrospectively collected pump data and Pearson correlations respectively). These two studies had slightly different outcomes, with one (137) assessing the effect of age on two different aspects of

adherence to insulin therapy and the other (138) assessing adherence at two different timepoints, again making meta-analysis not possible.

All of the studies assessing the relationship between age and adherence were observational studies, which according to the GRADE framework (see section 2.2.7), begins the body of evidence at “low certainty”. There were insufficient studies that demonstrated either a large magnitude of effect, a dose-response gradient, or a reduction in the effect size with additional confounders in order to increase the grading for this factor. Reduction of the grade by reason of risk of bias (including publication bias), imprecision, inconsistency or indirectness was also not considered necessary, leaving the body of evidence for this factor as “low certainty”.

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Jacobson, 1990 (163)	NK	61	Self-created 4-point scale (1-4; poor-excellent), used by paediatricians or diabetes nurse specialists to make an assessment. Validated by Jacobson et al., 1987.	N	r= -0.4	Y	<0.007	
					β= -0.11	Y	0.0001	
Patton, 2017 (165)	5.2 (0.27-6.94)	116	BOLUS score	Y	r=-0.054	N	>0.05	

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Ying, 2017 (166)	14.39 (NK)	57	Medication Possession Ratio (MPR) and HbA1c	Y	β= -0.435	Y	<0.05	MPR equals the total number of days of supply for all claims during the study period divided by a total number of days elapsed during the period.
Morris, 1997 (167)	16 (NK)	89	Medication Possession Ratio (MPR)	Y	<10 years old mean score: ~725	Y	0.0001	Results published were the raw scores calculated, with higher scores meaning better adherence. They are listed here as approximations as they were only published in graph form.
					10-15 years old mean score: ~400			
					15-20 years old mean score: ~350			
					>20 years old mean score: 520			

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Johnson, 1990 (168)	NK (6-19)	78	24-hour recall interviews	Y	r= 0.755	Y	<0.05	Higher scores conferred to worse adherence, hence this positive value indicating that adherence worsens with age.
Palardy, 1998 (116)	14.07 (11-17)	101	Summary of Self-Care Activities Questionnaire	N	$R_{1,2}$= -0.06	N	>0.05	Used zero-order correlations ($r_{1,2}$), indcating that no variables have been controlled for.
Anderson, 1990 (169)	13.3 (6-21)	121	Diabetes Family Responsibility Questionnaire (DFRQ)	N	Mother's report: r= 0.26 Child's report: r= 0.29	Y	<0.01	Higher scores indicated worse adherence, so the positive relationship actually indicates poorer adherence with increasing age.

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Hanson, 1989 (122)	NK	135	Self-report questionnaire based on Cerkoney and Hart, 1980	N	r= -0.21	Y	0.008	
Nakamura, 2019 (128)	13.1 (NK)	123	Revised Diabetes Self-Care Inventory (SCI-R)	N	r= 0.21	Y	<0.05	Question was phrased as "regularity of insulin injections *and snacks*."
Hanson, 1995 (123)	15.2 (12-20)	157	Interview	N	r= -0.44	Y	<0.0001	
Calkins-Smith, 2018 (132)	13.68 (10-17)	90	BOLUS scores	Y	r= -0.27	Y	<0.01	
La Greca, 1995 (133)	14.2 (11-18)	74	Interview (developed by Hanson et al., 1992)	N	r= -0.24	Y	<0.05	

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Pereira, 2008 (136)	15 (10-18)	157	Self-Report Questionnaire on Adherence (Almeida & Pereira, 2003)	N	r= 0.221	Y	<0.01	Higher scores on the questionnaire used in this study indicated worse adherence, so this positive result should be interpreted as "adherence become worse with increasing age".
Driscoll, 2013 (137)	13.11 (7-19)	31	Retrospectively taken from patients' insulin pumps	Y	Bolus delivering: r= -0.46	Y	<0.01	
					Carbohydrates being entered into calculator before calculating insulin dose: r= -0.46	Y	<0.05	

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Wiebe, 2011 (177)	12.79 (10-15.99)	82	Self-Care Inventory (SCI)	N	Parent's report at T1: R_2= -0.28	Y	<0.01	Used Multiple Regression Analysis (MRA; R_2).
					Child's report at T1: R_2= -0.17	N	>0.05	
					Parent's report at T2: R_2= -0.23	Y	<0.05	
					Child's report at T2: R_2= -0.05	N	>0.05	
Hanson, 1987 (125)	14.4 (NK)	93	Self-report and observation (Cerkoney and Hart and Schlenk and Hart)	N	r= -0.21	Y	<0.05	
					β= -0.182	N	>0.05	
Miller-Johnson, 1994 (140)	13 (8-18)	88	Self-report diary	N	Parent's report: r= -0.3	Y	<0.01	
					Child's report: r= -0.28	Y	<0.01	
					Nurse's report: r= -0.33	Y	<0.01	

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Stewart, 2000 (160)	Case: 15.08, control: 15.17 (9-21)	70	Questionnaire constructed based upon Littlefield et al., 1992	N	r= -0.2	N	>0.05	Specifically assessed the relationship with adherence to "pubertal stage", with adherence non-significantly worsening with advancing pubertal stage (i.e.- increasing age)
O'Connell, 2011 (143)	13.6 (NK)	100	Retrospectively taken from patients' insulin pumps	Y	r= -0.22 bolus events each day per year of age	Y	0.001	
Schober, 2011 (144)	NK (10-21)	2011	Diabetes Self-Management Profile (DSMP;	Y	Mean age of compliant group: 14.00	Y	<0.01	Participants were placed in either the

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
			Harris et al., 2000)		Mean age of non-compliant group: 15.00			adherent or non-adherent group depending on the responses to the questionnaire, with the mean age of each group being calculated to try to assess the relationship of adherence with age.

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Jacobson, 1987 (178)	12.8 (9-15)	57	Rated by healthcare providers	N	"Patients aged 10-20 years had… a lower adherence index when compared with patients younger than 10 years or older than 20 years" (no numerical value stated)	Y	<0.001	The results were published as quoted with no precise numerical effect.
Kristensen, 2012 (145)	12.3 (NK)	1028	Adherence in Diabetes Questionnaire (ADQ)	N	r= -0.31	Y	<0.001	
Ott, 2000 (148)	13.97 (11-18)	161	Summary of Self-Care Activities (Schafer et al. 1983)	N	$R_{1,2}$= -0.04	N	>0.05	Used zero order correlations.
Patton, 2010 (150)	11.8 (2-17)	201	Self-created survey	Y	MDI users: r= 0.04	N	0.7	
					CSII users: r= -0.01	N	0.99	

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
La Greca, 2002 (134)	14.2 (11-18)	74	Interview (developed by Hanson et al., 1992)	Y	r= -0.34	Y	<0.01	
Bond, 1992 (153)	14.2 (10-19)	56	Diabetes Regimen Compliance Questionnaire (DRCQ; Brownlee-Duffeck et al., 1987)	Y	r= -0.28	Y	<0.05	Used several questionnaires, but only one of them had published results relating to age.
Florian, 1998 (154)	15.11 (12-17)	88	Self-Care Questionnaire (Glasgow et al., 1987)	N	r= -0.16	N	>0.05	
Maliszewski, 2017 (151)	13.64 (NK)	91	BOLUS scores	Y	r= -0.286	Y	<0.01	
Brownlee-Duffeck, 1987 (156)	18 (13-26)	54	Diabetes Regimen Adherence Questionnaire (DRAQ)	N	r= -0.02	N	>0.05	
					β= -0.58	N	>0.05	
Vaala, 2015 (158)	14.47 (12-17)	174	Self-Care Inventory - Revised (SCI-R)	N	R_2= -0.18	Y	<0.05	Used MRA.

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Driscoll, 2016 (138)	13.15 (7-19)	98	Retrospectively taken from patients' insulin pumps	Y	T1: r= -0.271	Y	<0.01	
					T2: r= -0.243	Y	<0.01	
Moret, 1995 (193)	10.2 (7-13)	165	Insulin adjustment score	Y	r= 0.28	Y	<0.001	
Van Dongen, 2005 (192)	12.7 (10-15)	53	Insulin Required of Adherence Scale	Y	r= -0.4	Y	<0.01	

Table 3.4 Summary of results of studies that assessed the association between adherence and age. Legend: ADQ: Adherence in Diabetes Questionnaire, DRCQ: Diabetes Regimen Compliance Questionnaire, DFRQ: Diabetes Family Responsibility Questionnaire, MPR: Medication Possession Ratio, SCI: Self-Care Inventory, SCI-R: Revised Self-Care Inventory, Y: yes, N: No, r: Pearson correlation coefficient value, β: beta-value, R_2: multiple regression analysis value, $R_{1,2}$: zero order correlation value, HbA1c: glycated haemoglobin, MRA: Multiple Regression Analysis. Significant results indicating a positive relationship between increasing age and adherence are coloured green and significant results indicating a negative relationship between increasing age and adherence are coloured orange. Results that were not significant have been left white.

3.6.2. HbA1c/Glycaemic Control

Twenty studies (121,123,125,126,128,132,135,137,139–141,144,145,151,154,155,159,160,173,176) assessed the correlation between treatment adherence and HbA1c. For one of these studies, the phrasing used was “glycaemic control”. A summary of the studies and their results can be found in Table 3.5. Statistically significant results that suggest HbA1c decreases/glycaemic control improves with improved adherence have been coloured green. Results that were not statistically significant have been left white. One result is yellow as 1 of the domains that it assessed was significant while the other was not significant.

All of the included studies suggested that HbA1c decreased/glycaemic control improved with better adherence. 15 studies (121,123,125,126,128,132,135,137,141,145,151,154,155,160,173) found the relationship to be statistically significant, unanimously across all of their assessed domains.

The studies included a total of 3 365 children and young people with diabetes with a mean of 168 children and a range of 31 to 1028.

The 20 studies used 15 different methods of measuring adherence.

One study (176) found that adherence at study entry was not significantly associated with HbA1c at follow-up, but that the relationship was significant across all other domains (adherence at study entry vs HbA1c at study entry and adherence at follow-up vs HbA1c at both study entry and follow-up).

Another study (159) found that the relationship was not significant when looking at specific age groups (aged 8-11 and 12-17) but was significant when looking at the total sample.

One study (144) found that the relationship was significant when comparing those that were compliant (group A) versus those that were intentionally non-compliant (group B), but not when comparing those that were unintentionally non-compliant (group C) with either of the other groups.

Two studies (139,140) found the relationship to be not significant in the one domain assessed (that being the sample as a whole). One of these studies (139) was approaching significance, with a p-value of 0.056.

No studies - significantly or not significantly - demonstrated that HbA1c increases with improved adherence.

Statistically significant results that demonstrate HbA1c decreases/glycaemic or metabolic control improves with improved treatment adherence are coloured in green. Results that were not statistically significant have been left white.

Studies differed considerably in their methods of measuring adherence and sample populations, so meta-analysis was not considered appropriate.

All of the studies assessing the relationship between HbA1c/glycaemic control and adherence were observational studies, which according to the GRADE framework (see section 2.2.7), begins the body of evidence at “low certainty”. There were insufficient studies that demonstrated either a large magnitude of effect, a dose-response gradient, or a reduction in the effect size with additional confounders in order to increase the grading for this factor. Reduction of the grade by reason of risk of bias (including publication bias), imprecision, inconsistency or indirectness was also not considered necessary, leaving the body of evidence for this factor as “low certainty”.

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Baucom, 2015 (173)	7.46 (NK)	175	Questionnaire based on the Self-Care Inventory (SCI)	N	r= -0.31	Y	<0.001	
Kristensen, 2012 (145)	12.3 (NK)	1028	Adherence in Diabetes Questionnaire (ADQ)	N	Child's report: r= -0.36	Y	<0.001	
					Parent's report: r= -0.32	Y	<0.001	
Allen, 1983 (139)	11.2 (8-17)	34	Rated by two members of clinic staff (5-point Likert-like scale)	N	r= 0.28	N (approaching significance)	0.056	Assessed "metabolic control" as opposed to HbA1c, so the positive correlation should be interpreted as "metabolic control improved as adherence improved".
Nakamura, 2019 (128)	13.1 (NK)	123	Revised Diabetes Self-Care Inventory (SCI-R)	N	r= 0.266	Y	<0.01	Assessed "glycaemic control" as opposed to HbA1c, so the positive correlation should be interpreted as "glycaemic control improved as adherence improved".

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Hanson, 1995 (123)	15.2 (12-20)	157	Interview	N	r= -0.3	Y	<0.0001	
Calkins-Smith, 2018 (132)	13.68 (10-17)	90	BOLUS scores	Y	r= -0.4	Y	<0.001	
Griva, 2000 (135)	20.6 (NK)	64	Questionnaire based on the Reported Adherence to Medication Scale (Horne et al. 1999)	N	r= -0.26	Y	<0.01	
McGrady, 2014 (176)	17.45 (15-20)	105	Self-Care Inventory	N	Adherence at entry vs HbA1c at entry: r= -0.28	Y	<0.01	
					Adherence at entry vs HbA1c at follow-up: r= -0.16	N	>0.05	
					Adherence at follow-up vs HbA1c at entry: r= -0.32	Y	<0.01	

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
					Adherence at follow-up vs HbA1c at follow-up: r= -0.48	Y	<0.01	
Driscoll, 2013 (137)	13.11 (7-19)	31	Retrospectively taken from patients' insulin pumps	Y	Adherence to bolus frequency: r= -0.37	Y	<0.05	
					Adherence to carbohydrate input: r= -0.34	Y	<0.05	
Hanson, 1987 [study 1] (125)	14.4 (NK)	93	Self-report and observation (Cerkoney and Hart and Schlenk and Hart)	N	r= -0.3	Y	<0.01	One of two papers with this lead author written during this year and as such, this will be denoted as “Hanson, 1987 [study 1]”.

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Miller-Johnson, 1994 (140)	13 (8-18)	88	Self-report diary	Y	r= -0.22	N	>0.05	Note that elsewhere where results of this paper have been published, it has not specifically reported insulin adherence; some of its assessed factors were reported as a composite index and others individually.
Berg, 2011 (141)	12.49 (NK)	252	Self-Care Inventory (SCI)	N	r= -0.31	Y	<0.01	
Stewart, 2000 (160)	Case: 15.08, control: 15.17 (9-21)	70	Questionnaire constructed based upon Littlefield et al., 1992	N	r= -0.41	Y	<0.001	
Kyngäs, 2007 (121)	15.1 (NK)	289	Questionnaire (not otherwise specified)	N	Of the group who had a HbA1c below 53mmol/mol, 56% were classed as having good adherence.	Y	<0.0001	

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
					Of the group who had a HbA1c above 53mmol/mol, 9% were classed as having good adherence.			
Schober, 2011 (144)	NK (10-21)	241	Diabetes Self-Management Profile (DSMP; Harris et al., 2000)	Y	Mean HbA1c of patients classed as being "compliant" (Group A) was 62mmol/mol	N/A	N/A	The study stated that "non-compliance" occurred when participants had deliberately been non-compliant with insulin therapy and "management problems" occurred when participants had unintentionally been non-compliant.
					Mean HbA1c of patients classed as "non-compliant" (Group B) was 72mmol/mol	Y (A vs B), N for other correlations	<0.01 (A vs B), >0.05 (for other correlations)	

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
					Mean HbA1c of patients classed as having "management problems" (Group C) was 62mmol/mol	N for all correlations	>0.05 for all correlations	
Hanson, 1987 [study 2] (126)	14.5 (NK)	104	Self-Report and Observation (based on Cerkoney and Hart, 1980 and Schenk and Hart, 1984)	N	r= -0.28	Y	<0.001	One of two papers with this lead author written during this year and as such, this will be denoted as "Hanson, 1987 [study 2]".
Florian, 1998 (154)	15.11 (12-17)	88	Self-Care Questionnaire (Glasgow et al., 1987)	N	r= -0.25	Y	<0.01	
Maliszewski, 2017 (151)	13.64 (NK)	91	BOLUS scores	Y	r= -0.556	Y	<0.01	
Kichler, 2008 (155)	14.1 (range 11-17)	75	Self-Care Inventory (SCI)	N	r= -0.54	Y	<0.01	
Peters, 2008 (159)		167	Diabetes Self-Management	Y	Total sample: r= -0.159	Y	<0.05	

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
	12.8 (range 8-17)		Profile (DSMP; Harris et al., 2000)		Aged 8-11: r= -0.072	N	>0.05	
					Age 12-17: r= -0.154	N	>0.05	

Table 3.5 Studies that assessed the relationship between adherence and HbA1c/glycaemic control and their results. Legend; HbA1c: glycated haemoglobin, mmol/mol: millimoles per mole, DSMP: Diabetes Self-Management Profile, SCI: Self-Care Inventory, SCI-R: Revised Self-Care Inventory, r: Pearson correlation coefficient value, ADQ: Adherence in Diabetes Questionnaire, Y: yes, N: no. Statistically significant results that demonstrate HbA1c decreases/glycaemic or metabolic control improves with improved treatment adherence are coloured in green. Results that were not statistically significant have been left white. One study assessed correlations between 3 groups, with 1 of these correlations being significant and the others not significant; this result has been coloured yellow.

3.6.3. Duration of Diabetes

19 studies (116,120–123,128,131,133,136,144,145,148,150,154,158,160,163,169,178) assessed the association between the duration of diabetes and treatment adherence. Table 3.6 summarises these studies and their results.

The studies contained a total of 3 527 children and young people with diabetes, with a mean of 196 children per study and a range of 57 to 1 028. 29.1% of participants came from one study. One study did not indicate their sample size and was left out of this calculation.

The 19 studies used 16 different methods of measuring adherence.

Nine studies (120–123,128,131,136,145,154) had statistically significant results that suggested that adherence worsens with increasing disease duration, with the remainder of the studies reporting a relationship that was not significant.

No studies - significantly or not significantly - suggested that adherence improves with increased disease duration.

No studies with statistically significant results shared the same method of measuring and reporting adherence or had similar sample sizes and mean population ages, so meta-analysis was not possible.

All of the studies assessing the relationship between duration of diabetes and adherence were observational studies, which according to the GRADE framework (see section 2.2.7), begins the body of evidence at “low certainty”. There were insufficient studies that demonstrated either a large magnitude of effect, a dose-response gradient, or a reduction in the effect size with additional confounders in order to increase the grading for this factor. Reduction of the grade by reason of risk of bias (including publication bias), imprecision, inconsistency or indirectness was also not considered necessary, leaving the body of evidence for this factor as “low certainty”.

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Anderson, 1990 (169)	13.3 (6-21)	121	Diabetes Family Responsibility Questionnaire (DFRQ)	N	Mother's report: r= 0.17	N	>0.05	Higher scores in this questionnaire confer to worse adherence, so the positive relationship should be interpreted as "adherence decreased with increasing duration of diabetes".
					Child's report: r= 0.16	N	>0.05	
Kyngäs, 2000 (120)	15.1 (NK)	289	Questionnaire (not otherwise specified)	N	36% of participants with a disease duration of 1-3 years were rated as having "good" compliance	Y	<0.001	Study stated the percentages as written here but did not express this as a Pearson correlation. They did state that the relationship was significant.
					17% of participants with a disease duration of 3-6 years were rated as having "good" compliance			
					12% of participants with a disease duration of longer than 6 years were rated as having "good" compliance			

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Jacobson, 1990 (163)	NK	61	Self-created 4-point scale (1-4; poor-excellent), used by paediatricians or diabetes nurse specialists to make an assessment. Validated by Jacobson et al., 1987.	N	No numerical value stated, but the relationship was stated as insignificant.	N	>0.05	Factor was specifically stated as "time between diagnosis and study entry".
Hanson, 1989 (122)	NK	135	Self-report questionnaire based on Cerkoney and Hart, 1980	N	r= -0.16	Y	0.032	
Patton, 2010 (150)	11.8 (2-17)	201	Self-created questionnaire	Y	MDI users: r= -0.09	N	0.37	
					CSII users: r= -0.07	N	0.49	
Nakamura. 2019 (128)	13.1 (NK)	123	Revised Diabetes Self-Care Inventory (SCI-R)	N	r= -0.162	Y	<0.05	

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Hanson, 1995 (123)	15.2 (12-20)	157	Interview	N	r= -0.38	Y	<0.0001	
Smith, 2014 (131)	13.6 (NK)	NK	Diabetes Self-Management Profile (DSMP - Harris et al., 2000)	N	r= -0.42	Y	<0.001	
La Greca, 1995 (133)	14.2 (11-18)	74	Interview (developed by Hanson et al., 1992)	N	NK (no value given, but relationship was stated as insignificant)	N	>0.05	
Pereira, 2008 (136)	15 (10-18)	157	Self-Report Questionnaire on Adherence (Almeida & Pereira, 2003)	N	r= 0.308	Y	<0.001	Result was expressed as a t-test; these serve a similar purpose to Pearson correlations, indicating the direction of a relationship and the likelihood that the null hypothesis can be rejected, with results further from 0 in either direction increasing likelihood that it can be rejected. They are generally expressed between -3 and +3 (194) .

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
					β= 0.273	Y	<0.001	Higher scores in this questionnaire confer to worse adherence, so the positive relationship should be interpreted as "adherence decreased with increasing duration of diabetes".
Stewart, 2000 (160)	Case: 15.08, control: 15.17 (9-21)	70	Questionnaire constructed based upon Littlefield et al., 1992	N	r= 0.08	N	>0.05	

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Kyngäs, 2007 (121)	15.1 (NK)	289	Questionnaire (not otherwise specified)	N	No numerical value was given, but it was stated within the body of text that those with 1-3 years disease duration had statistically significantly better adherence than those with more than 3 years disease duration.	Y	<0.0001	
Schober, 2011 (144)	NK (10-21)	241	Diabetes Self-Management Profile (DSMP; Harris et al., 2000)	Y	Mean disease duration in compliant patients was 6.2 years. Mean disease duration in non-compliant patients was 6.2 years. Mean disease duration in patients with management problems was 6.1 years.	N	>0.05	The study stated that "non-compliance" occurred when participants had deliberately been non-compliant with insulin therapy and "management problems" occurred when participants had unintentionally been non-compliant.

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Jacobson, 1987 (178)	12.8 (9-15)	57	Rated by healthcare providers	N	No value given, but relationship was stated as insignificant.	N	>0.05	
Kristensen, 2012 (145)	12.3 (NK)	1028	Adherence in Diabetes Questionnaire (ADQ)	N	r= -0.17	Y	<0.001	
Ott, 2000 (148)	13.97 (11-18)	161	Summary of Self-Care Activities (Schafer et al. 1983)	N	$R_{1,2}$: -0.1	N	>0.05	Used zero order correlations.
Florian, 1998 (154)	15.11 (12-17)	88	Self-Care Questionnaire (Glasgow et al., 1987)	N	r= -0.19	Y	<0.05	
Vaala, 2015 (158)	14.47 (12-17)	174	Self-Care Inventory - Revised (SCI-R)	N	R_2: 0.08	N	>0.05	Used multiple regression analysis (MRA).
Palardy, 1998 (116)	14.07 (11-17)	101	Summary of Self-Care Activities Questionnaire (Schafer et al. 1983)	N	$R_{1,2}$: = -0.11	N	>0.05	Used zero order correlations.

Table 3.6 Studies assessing the relationship between disease duration and treatment adherence and their results. Legend; ADQ: Adherence in Diabetes Questionnaire, SCI-R: Revised Self-Care Inventory, DSMP: Diabetes Self-Management Profile, DFRQ: Diabetes Family Responsibility Questionnaire, MRA: Multiple Regression Analysis, MDI: Multiple Daily Injections, CSII: Continuous Subcutaneous Insulin Infusion, Y: yes, N: no, NK: Not Known, r: Pearson correlation coefficient value, $R_{1,2}$: zero order correlation value, R_2: Multiple Regression Analysis score. Statistically significant results suggestive of worsening adherence with increasing disease duration are coloured orange. Results left in white are not statistically significant.

Table 3.7. Significant results suggesting that males have better adherence are coloured blue and significant results suggesting that females have better adherence are coloured orange. Results that were not statistically significant have been left white. Note that where Pearson correlations (r) or β-values have been used, results may be positive or negative even when showing the same relationship, depending upon the value assigned to each gender in the respective studies.

The studies contained a total of 2 647 children and young people with diabetes with a mean of 176 children in each study and a range of 34 to 1 028. 1 028/2 647 (38.8%) of these participants came from a single study.

The 15 studies used 15 different methods of measuring adherence; MPR was used twice, but one study used two different methods.

Of the 15 studies, 6 (136,144,154,161,166,168) found a significant association with gender. Five out of these 6 studies (136,144,154,166,168) (83.3%) suggested that males had better adherence and one (161) (17.7%) suggested that adherence was better in females.

Of the five studies that suggested adherence was better in males, three were European (Portuguese, Austrian and Dutch) studies, one was American and one was Malaysian with a weighted mean participant age of 14.9 years old (calculated from the 3 mean ages published). The study that suggested adherence was better in females took place in Kuwait and had a significantly lower mean age, with a mean age of 9.1 years old for the case group and 9.7 years old for the control group.

Studies differed considerably in their methods of measuring adherence and sample populations, so meta-analysis was not considered appropriate.

All of the studies assessing the relationship between gender and adherence were observational studies, which according to the GRADE framework (see section 2.2.7), begins the body of evidence at “low certainty”. There were insufficient studies that demonstrated either a large magnitude of effect, a dose-response gradient, or a reduction in the effect size with additional confounders in order to increase the grading for this factor. Reduction of the grade by reason of risk of bias (including publication bias), imprecision or indirectness was also not considered necessary. The inconsistency of the results warranted reducing the grading, leaving the body of evidence for this factor at “very low certainty”.

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Jacobson, 1987 (178)	12.8 (9-15)	57	Rated by healthcare providers	N	NK	N	>0.05	No specific value for effect on adherence given, but it is stated as not statistically significant.
Schafer, 1983 (164)	13 (range 12-14)	34	Barriers to Adherence and Problem-Solving Questionnaire and Summary of Self-Care Activities Questionnaire	Y	"tendencies for boys to report taking more care when measuring insulin" (no numerical value stated)	N	>0.05	Adherence in this context is "care taken in measuring insulin"
Kristensen, 2012 (145)	12.3 (NK)	1028	Adherence in Diabetes Questionnaire (ADQ)	N	r= 0.07 (girls more adherent)	N	>0.05	
Ying, 2017 (166)	14.39 (NK)	57	Medication Possession Ratio (MPR)	Y	β= -0.861 (males had better adherence)	Y	<0.05	
Morris, 1997 (167)	16 (NK)	89	Medication Possession Ratio (MPR)	Y	NK	N	>0.05	No specific value for effect on adherence given, but it is stated as not statistically significant.
Johnson, 1990 (168)	NK (6-19)	78	24-hour recall interviews	Y	F=4.61 (males had better adherence)	Y	<0.04	Used Analysis of Variance (ANOVA).

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Anderson, 1990 (169)	13.3 (6-21)	121	Diabetes Family Responsibility Questionnaire (DFRQ)	N	Mothers' report: r= -0.17 (females had better adherence)	N	>0.05	
					Child's report: r= 0.02 (males had better adherence)	N	>0.05	
Nakamura, 2019 (128)	13.1 (NK)	123	Revised Diabetes Self-Care Inventory	N	Males' mean score: 11.2, females' mean score: 10.7, with higher scores conferring to better adherence.	N	>0.05	Question where insulin adherence was assessed also assessed dietary adherence ("regularity of snacks and insulin injections").
La Greca, 1995 (133)	14.2 (11-18)	74	Interview (developed by Hanson et al., 1992)	N	NK	N	>0.05	No specific value for effect on adherence given, but it is stated as not statistically significant.
Pereira, 2008 (136)	15 (10-18)	157	Self-Report Questionnaire on Adherence (Almeida & Pereira, 2003)	N	β= -0.198 (males had better adherence)	Y	<0.01	
Stewart, 2000 (160)	Case: 15.08, control: 15.17 (9-21)	70	Questionnaire constructed based upon Littlefield et al., 1992	N	r= -0.26 (females had better adherence)	N	>0.05	

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Schober, 2011 (144)	NK (10-21)	241	Diabetes Self-Management Profile (Harris et al., 2000)	Y	Group A (compliant): 56% male	N/A	N/A	The study stated that "non-compliance" occurred when participants had deliberately been non-compliant with insulin therapy and "management problems" occurred when participants had unintentionally been non-compliant.
					Group B (non-compliant): 22% male	Y	<0.01 (A vs B)	
					Group C (management problems): 25% male	Y	<0.05 (A vs C)	
Abdul-Rasoul, 2013 (161)	Case: 9.1 (SD 3.7), control: 9.7 (SD 3.6)	Case group: 377, control group: 389	Paediatric Quality of Life Inventory (PedsQL) 3.0 Diabetes Module (of which 7 items out of 28 relate to adherence)	N	Males' mean score: 69.7, females' mean score: 76.6, with higher scores conferring to better adherence.	Y	<0.05	Gender was the only factor specifically assessed for adherence; this was still a composite index and not specifically regarding adherence to insulin therapy.
Florian, 1998 (154)	15.11 (12-17)	88	Self-Care Questionnaire (Glasgow et al., 1987)	N	r= -0.24 (males had better adherence)	Y	<0.05	
van Dongen, 2008 (192)	12.7 (10-15)	53	Insulin Required of Adherence Scale	Y	r= -0.2 (females had better adherence)	N	>0.05	

Table 3.7 Summary of results of studies that assessed the association between adherence and age. Legend; Y: yes, N: no, NK: not known, N/A: not applicable, PedsQL: Paediatric Quality of Life Inventory, DFRQ: Diabetes Family Responsibility Questionnaire, MPR: Medication Possession Ratio, ANOVA: Analysis of Variance, r:Pearson correlation coefficient value. Significant results where adherence was shown to be better in males have been highlighted in blue and significant results where adherence was shown to be better in females have been highlighted in orange. Result that were not statistically significant have been left in white. NB: whether the numerical value is positive or negative is not always consistent depending on the number each respective study assigned to which gender.

3.6.4. Perceptions of Family Conflict

Eight studies (123,136,140,151,160,162,164,192) assessed the impact of perceived family conflict upon treatment adherence. These eight studies and their results are summarised in Table 3.8. Statistically significant results suggesting that family conflict has a negative effect upon adherence are coloured orange. Results that were not statistically significant have been left white.

The studies included a total of 702 children and young people with diabetes with a mean of 88 children per study and a range of 34 to 157.

The eight studies used nine different methods of measuring adherence; the number of methods is greater than the number of studies due to one study using two methods.

Five studies (123,140,151,162,192) assessed the perceptions of both the child and a parent of family conflict and 3 studies (136,160,164) assessed only the child's perception of conflict. Subjective reports of adherence are from the perspective of the child unless otherwise specified.

One study (140) assessed 12 correlations so is discussed separately here. This study had two participant groups: parents and children receiving treatment in private hospitals and parents and children receiving treatment in public hospitals. Both parents and children gave reports on their perceptions of family conflict and treatment adherence. The patients' nurses also gave a report on the adherence of the patient.

In the public hospital group, the parent's perceptions of family conflict were significantly negatively correlated with the parent's and nurse's report of adherence but was not correlated with the child's report of adherence. The child's perceptions of family conflict were significantly negatively correlated with the parent's and child's reports of adherence, but not the nurse's.

In the private hospital group, only the parent's report of family conflict with the parent's report of adherence was significantly negatively associated. All other correlations were insignificant. Of all the correlations assessed in this study, 5/12 (42%) of them suggested that adherence worsens with family conflict. The remaining 7/12 (58%) showed no significant interaction. Of the significant interactions, 4/5 (80%) were from the public hospital group.

Of the remaining studies that assessed the relationship between the child's perceptions of family conflict and adherence, 3/7 (43%) (123,162,192) had statistically significant results that suggest adherence worsens with family conflict. The remaining 4/7 (57%) (136,151,160,164), had results that were not statistically significant. One of these studies (160) assessed the frequency and intensity of conflict as separate domains (with both having insignificant results).

Of the remaining studies (123,151,162,192) that examined the effect of the parent's report of family conflict, 2/4 (50%) (151,192) had statistically significant results suggesting that adherence worsens with family conflict, with the other 2/4 (50%) (123,162) having statistically insignificant results.

When looking at the effect of whether the report of family conflict comes from the child or their parents, 42% of the results based on children's reports were statistically significant versus 50% when the report came from parents, with all suggesting that family conflict has a negative effect upon adherence.

As a composite analysis of all studies that assessed family conflict and its effect on adherence, including all parents' and children's reports of both conflict and adherence and nurses' reports of adherence, there were 24 correlations assessed. 10/24 (42%) of these correlations had statistically significant results suggesting that adherence worsens with family conflict, with the remaining 14/24 (58%) having statistically insignificant results. 0/24 (0%) of the correlations assessed had statistically significant results that suggested adherence improves with family conflict.

Studies differed considerably in their methods of measuring adherence and sample populations, so meta-analysis was not considered appropriate.

All of the studies assessing the relationship between family conflict and adherence were observational studies, which according to the GRADE framework (see section 2.2.7), begins the body of evidence at "low certainty". There were insufficient studies that demonstrated either a large magnitude of effect, a dose-response gradient, or a reduction in the effect size with additional confounders in order to increase the grading for this factor. Reduction of the grade by reason of risk of bias (including publication bias), imprecision, inconsistency or indirectness was also not considered necessary, leaving the body of evidence for this factor as "low certainty".

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Maliszewski, 2017 (151)	13.64 (NK)	91	BOLUS scores	Y	Child's perception of conflict: r= -0.166	N	>0.05	
					Parent's perception of conflict: r= -0.293	Y	<0.01	
					Composite index of conflict: β= -0.235	Y	<0.05	
van Dongen, 2005 (192)	12.7 (10-15)	53	Insulin Required of Adherence Scale	Y	Child's perception of conflict: r= -0.38	Y	<0.01	
					Parent's perception of conflict: r= -0.39	Y	<0.01	
Hauser, 1990 (162)	12.8	52	Questionnaire (validated by Jacobson et al., 1987)	Y	Child's perception of conflict: r= -0.41	Y	<0.004	
					Parent's perception of conflict: r= -0.2	N	>0.05	
Schafer, 1983 (164)	13 (range 12-14)	34	Barriers to Adherence and Problem-Solving Questionnaire and	Y	Child's perception of conflict: r= 0.1	N	>0.05	Adherence in this context is "care

			Summary of Self-Care Activities Questionnaire					taken in measuring insulin"
Hanson, 1995 (123)	15.2 (12-20)	157	Interview	N	Child's perception of conflict: r= -0.3	Y	<0.0001	Specifically assessed mother's perceptions, where other papers have been general in assessing "parents".
					Mother's perception of conflict: r= -0.09	N	>0.05	
Pereira, 2008 (136)	15 (10-18)	157	Self-Report Questionnaire on Adherence (Almeida & Pereira, 2003)	N	Child's perception of conflict: r= 0.053	N	>0.05	
Miller-Johnson, 1994 (140)	13 (8-18)	88	Self-report diary	N	Public hospital: parent's perception of conflict, parent's report of adherence: r= -0.59, β= -0.54	Y	<0.001	
					Public hospital: parent's perception of conflict, child's report of adherence: r= -0.25, β= 0.22	N	>0.05	
					Public hospital: parent's perception of conflict, nurse's report of adherence:	Y	<0.05	

					r= -0.3, β= -0.3			
					Public hospital: child's perception of conflict, parent's report of adherence: r= -0.37, β= -0.5	Y	r: <0.01 β: <0.001	
					Public hospital: child's perception of conflict, child's report of adherence: r= -0.5, β= -0.52	Y	<0.001	
					Public hospital: child's perception of conflict, nurse's report of adherence: r= -0.19, β= -0.25	N	>0.05	
					Private hospital: parent's perception of conflict, parent's report of adherence: r= -0.32, β= 0.34	Y	<0.05	
					Private hospital: parent's perception of conflict, child's	N	>0.05	

					report of adherence: r= -0.02, β= -0.01			
					Private hospital: parent's perception of conflict, nurse's report of adherence: r= -0.09, β= -0.09	N	>0.05	
					Private hospital: child's perception of conflict, parent's report of adherence: r= -0.15, β= -0.22	N	>0.05	
					Private hospital: child's perception of conflict, child's report of adherence: r= -0.25, β= -0.31	N	>0.05	
					Private hospital: child's perception of conflict, nurse's report of adherence: r= -0.06, β= -0.13	N	>0.05	

Stewart, 2000 (160)	Case: 15.08, control: 15.17 (9-21)	70	Questionnaire constructed based upon Littlefield et al., 1992	N	Child's report, frequency of conflict: r= 0.07	N	>0.05	
					Child's report, intensity of conflict: r= 0.01	N	>0.05	

Table 3.8 Studies assessing the relationship between family conflict and adherence and their results. Legend; Y: yes, N: no. r: Pearson correlation coefficient value, β: beta value. Statistically significant results suggesting that family conflict has a negative effect upon adherence are coloured orange. Insignificant results have been left white.

3.6.5. Depression

Seven studies (117,132,142,146,151,173,195) assessed the relationship between depression/depressive symptoms in children and treatment adherence and one (177) assessed the relationship between depression in the child's mother and treatment adherence.

The studies contained a total of 3 527 children and young people with diabetes, with a mean of 196 children per study and a range of 57 to 1 028. 29.1% of participants came from one study. One study did not indicate their sample size and was left out of this calculation.

The seven studies used six different methods of measuring adherence and four different measures for assessing depression. These four methods were:

- Centre for Epidemiologic Studies – Depression Scale (132,151,173,177)
- Children's Diagnostic Interview for Psychiatric Disorders (117)
- M5-336 Questionnaire (142)
- Children's Depression Inventory (146)

All seven studies that assessed depression in the child had significant results that suggest adherence worsens with depression. Three of these studies (132,142,151) specifically assessed adherence to insulin treatment and presented this component of adherence separately with the others assessing adherence to insulin but presenting the results as a composite measure of all aspects of adherence.

Two of these studies (132,151) used the same measure of adherence, that being BOLUS scores, but did not control for the same variables, so meta-analysis was not possible.

No studies had results – significant or not significant – suggesting that treatment adherence improved with depression.

The study assessing maternal depression assessed depression and adherence at study entry (T1) and follow-up (T2) and tested for correlations between all of these variables and times. No relationships were statistically significant except the relationship between maternal depression at T2 and adherence at T2, which showed worsening adherence with depression.

Table 3.9 summarises all of the above studies and their results. Significant results that suggest adherence worsens with depression have been coloured orange. Results that were not statistically significant have been left white.

Studies differed considerably in their methods of measuring adherence and sample populations, so meta-analysis was not considered appropriate.

All of the studies assessing the relationship between depression and adherence were observational studies, which according to the GRADE framework (see section 2.2.7), begins the body of evidence at "low certainty". There were insufficient studies that demonstrated either a large magnitude of effect, a dose-response gradient, or a reduction in the effect size with additional confounders in order to increase the grading for this factor. Reduction of the grade by reason of risk of bias (including publication bias), imprecision, inconsistency or indirectness was also not considered necessary, leaving the body of evidence for this factor as "low certainty".

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Berger, 2019 (117)	14.14 (NK)	322	Diabetes Self-Management Interview	N	4.9% of the participants who were classed as being adherent had depression	Y	<0.005	
					13.4% of the participants who were classed as unintentionally non-adherent had depression			
					18.3% of the participants who were classed as intentionally			

					manipulative non-adherent had depression			
Baucom, 2015 (173)	7.46 (NK)	175	Questionnaire based on the Self-Care Inventory (SCI)	N	r= -0.33	Y	<0.001	
Calkins-Smith, 2018 (132)	13.68 (10-17)	90	BOLUS scores	Y	r= -0.33	Y	<0.001	
Wiebe, 2011 (177)	12.79 (10-15.99)	82	SCI	N	Maternal depression at study entry with adherence at study entry: Child's report: R_2: -0.04.	N	>0.05	Maternal depression. Used multiple regression analysis (MRA).
					Maternal depression at study entry with adherence at study entry: Parent's report: R_2: -0.06.	N	>0.05	
					Maternal depression at study entry with	N	>0.05	

					adherence at follow up: Child's report: R_2: -0.15.			
					Maternal depression at study entry with adherence at follow up: Parent's report: R_2: -0.09.	N	>0.05	
					Maternal depression at follow up with adherence at study entry: Child's report: R_2: 0.01.	N	>0.05	
					Maternal depression at follow up with adherence at study entry: Parent's report: R_2: -0.04.	N	>0.05	
					Maternal depression at follow up with adherence at follow up: Child's report:	N	>0.05	

					R_2: -0.12			
					Maternal depression at follow up with adherence at follow up: Parent's report: R_2: -0.29.	Y	<0.01	
Wheeler, 2012 (142)	NK (13-18)	28	Questionnaire constructed by study authors	Y	r= -0.498	Y	<0.01	
Littlefield, 1992 (146)	15.3 (13-18)	193	Questionnaire constructed by study authors	N	r= -0.5	Y	<0.001	
Maliszewski, 2017 (151)	13.64 (NK)	91	BOLUS scores	Y	r= -0.28	Y	<0.01	
Rossello, 2006 (195)	12.29 (8-17)	101	Questionnaire not otherwise specified	N	r= 0.342	Y	<0.01	"Adherence" in this case is actually the perceived difficulty of performing management tasks, so this result should be interpreted as "depressive state is associated with more

								difficulty in performing management tasks".

Table 3.9 Studies assessing the relationship between depression in children and their mothers and treatment adherence, and their results. Legend; SCI: Self-Care Inventory, Y: yes, N: no, NK: Not Known, r: Pearson correlation coefficient value, R_2: multiple regression analysis value. Significant results suggesting that adherence worsens with depression are coloured in orange. Insignificant results have been left white.

3.6.6. Self-Efficacy

Seven studies (116,135,141,142,146,148,160) assessed the relationship between the child's self-efficacy and adherence. Self-efficacy in this context refers to a child's confidence in their abilities to perform various diabetes management tasks. These studies and their results are summarised in Table 3.10. Statistically significant results that suggest a positive relationship between self-efficacy and adherence are coloured green. Results that were not statistically significant have been left white.

The studies included 869 children and young people with diabetes with a mean of 124 children and a range of 28-252.

The seven studies used six different methods of measuring adherence. Self-efficacy was assessed within these methods.

5/7 (71%) (141,142,146,148,160) of these studies had statistically significant results that suggest increased self-efficacy is associated with improved adherence unanimously across all of their published results.

1/7 (14%) (116) found the relationship to be statistically significant when looking at the Pearson correlation (r), but that the size of the effect (β) was not significant.

1/7 (14%) (135) had results that were not statistically significant.

0/7 (0%) had results suggesting that increased self-efficacy is associated with worse adherence.

Studies differed considerably in their methods of measuring adherence and sample populations, so meta-analysis was not considered appropriate.

All of the studies assessing the relationship between self-efficacy and adherence were observational studies, which according to the GRADE framework (see section 2.2.7), begins the body of evidence at "low certainty". There were insufficient studies that demonstrated either a large magnitude of effect, a dose-response gradient, or a reduction in the effect size with additional confounders in order to increase the grading for this factor. Reduction of the grade by reason of risk of bias

(including publication bias), imprecision, inconsistency or indirectness was also not considered necessary, leaving the body of evidence for this factor as “low certainty”.

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Palardy, 1998 (116)	14.07 (11-17)	101	Summary of Self-Care Activities Questionnaire	N	$R_{1,2} = 0.24$	Y	<0.05	Used zero order correlations.
					β= 0.1	N	>0.05	
Griva, 2000 (135)	20.6 (NK)	64	Questionnaire based on the Reported Adherence to Medication Scale (Horne et al. 1999)	N	r= -0.25	N	>0.05	Higher scores in the self-efficacy scale used by this study conferred to lower self-efficacy, so this result should be interpreted as "lower self-efficacy was negatively associated with adherence" (though the result is insignificant).
Berg, 2011(141)	12.49 (NK)	252	Self-Care Inventory (SCI)	N	r= 0.4	Y	<0.01	
Stewart, 2000 (160)	Case: 15.08, control: 15.17 (9-21)	70	Questionnaire constructed based upon Littlefield et al., 1992	N	r=0.64	Y	<0.001	
Wheeler, 2012 (142)	NK (13-18)	28	Questionnaire constructed by study authors	Y	r= 0.48	Y	<0.01	
Littlefield, 1992 (146)	15.3 (13-18)	193	Questionnaire constructed by study authors	N	r= 0.57	Y	<0.001	

Ott, 2000 (148)	13.97 (11-18)	161	Summary of Self-Care Activities (Schafer et al. 1983)	N	$R_{1,2}$ = 0.21	Y	<0.01	Used zero order correlations.

Table 3.10 Summary of studies assessing the relationship between the child's self-efficacy and adherence. Legend; SCI: Self-Care Inventory, Y: yes, N: no, $R_{1,2}$: zero order correlation value, r: Pearson correlation coefficient value, ß: beta value. Statistically significant results that suggest a positive relationship between self-efficacy and adherence are coloured green. Statistically insignificant results have been left white.

3.6.7. Perceptions of Family Support

Seven studies (120,126,133,134,136,148,164) assessed the relationship between support from family members and adherence. Their results are summarised in Table 3.11. Statistically significant results indicative of a positive relationship between familial support and adherence have been coloured green. Results that were not statistically significant have been left white.

The studies included a total of 882 children and young people with diabetes with a mean of 126 children in each study and a range of 34 to 289.

The seven studies used seven different methods of measuring adherence; the interview developed by Hanson et al., was used twice, but one study used two different methods. Perceptions of family support was assessed within these measures.

5/7 (71%) (120,126,133,136,148) of these studies had statistically significant results suggesting a positive relationship between familial support and adherence.

The remaining 2/7 (29%) (134,164) had statistically insignificant results.

The five studies that had results suggestive of a statistically significant positive relationship expressed the relationship of familial support to a composite index of all aspects of adherence. The two studies that did not have statistically significant results expressed the relationship of familial support to adherence to insulin therapy specifically.

0/7 (0%) of studies had statistically significant results suggestive of a negative relationship between familial support and adherence.

Studies differed considerably in their methods of measuring adherence and sample populations, so meta-analysis was not considered appropriate.

All of the studies assessing the relationship between family support and adherence were observational studies, which according to the GRADE framework (see section 2.2.7), begins the body of evidence at “low certainty”. There were insufficient studies that demonstrated either a large magnitude of effect, a dose-response gradient, or a reduction in the effect size with additional confounders in order to increase the grading for this factor. Reduction of the grade by reason of risk

of bias (including publication bias), imprecision, inconsistency or indirectness was also not considered necessary, leaving the body of evidence for this factor as “low certainty”.

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Schafer, 1983 (164)	13 (range 12-14)	34	Barriers to Adherence and Problem-Solving Questionnaire and Summary of Self-Care Activities Questionnaire	Y	Supportiveness of mother: r= -0.14	N	>0.05	
					Supportiveness of father: r= -0.07	N	>0.05	
Kyngäs, 2000 (120)	15.1 (NK)	289	Questionnaire (not otherwise specified)	N	Children deemed to have parental support: 33% were classed as having "good" adherence, 67% "satisfactory" and 0% as "poor"	Y	<0.001	
					Children deemed to not have parental support: 2% were classed as having "good" adherence, 84% as "satisfactory" and 14% as "poor"			
La Greca, 1995 (133)	14.2 (11-18)	74	Interview (developed by Hanson et al., 1992)	N	r= 0.37	Y	<0.01	
Pereira, 2008 (136)	15 (10-18)	157	Self-Report Questionnaire on Adherence (Almeida & Pereira, 2003)	N	r= 0.245	Y	<0.01	

Ott, 2000 (148)	13.97 (11-18)	161	Summary of Self-Care Activities (Schafer et al. 1983)	N	$R_{1,2}$: 0.36	Y	<0.005	Used zero order correlations.
Hanson, 1987 (126)	14.4 (NK)	93	Self-report and observation (Cerkoney and Hart and Schlenk and Hart)	N	r= 0.32	Y	<0.005	
La Greca, 2002 (134)	14.2 (11-18)	74	Interview (developed by Hanson et al., 1992)	Y	r= 0.11	N	>0.05	

Table 3.11 Summary of studies that assess the relationship between familial support and adherence. Legend; Y: yes, N: no, r: Pearson correlation coefficient value, $R_{1,2}$: zero order correlation value. Statistically significant results indicative of a positive relationship between familial support and adherence have been coloured green. Results that were not statistically significant have been left white.

3.6.8. Perceptions of Family Cohesion

Five studies (123,134,136,162,164) assessed the correlation between the perceptions of family cohesion and treatment adherence. Their results are summarised in Table 3.12. Statistically significant results that suggest that adherence improves with increasing family cohesion are coloured in green. Results that are not statistically significant have been left white. Correlations are based upon the child's perceptions of family cohesion unless otherwise specified.

The studies included a total of 474 children and young people with a mean of 95 children and a range of 34 to 157.

The five studies used six different methods of measuring adherence; the number of methods used is greater than the number of studies due to one study using two methods to measure adherence.

All 5 studies assessed the association of the child's perception of family cohesion with adherence, with 2/5 (40%) (123,134) having statistically significant results that suggested that adherence improves as the child's perceptions family cohesion increases. 1/5 (20%) (162) had statistically significant results that suggested adherence worsens as the child's perceptions of family cohesion increases. The remaining 2/5 (40%) (136,164) had results that were not statistically significant.

Two of these studies (123,162) also assessed the associations between treatment adherence and a parent's perceptions of family cohesion. 2/2 (100%) had statistically significant results that suggested adherence improves as parent's perceptions of family cohesion increases. It is worth noting that 1 of these studies (162) suggested the inverse relationship when looking at the child's perceptions of family cohesion.

Studies differed considerably in their methods of measuring adherence and sample populations, so meta-analysis was not considered appropriate.

All of the studies assessing the relationship between family cohesion and adherence were observational studies, which according to the GRADE framework (see section 2.2.7), begins the body of evidence at "low certainty". There were insufficient studies that demonstrated either a large magnitude of effect, a dose-response gradient, or a reduction in the effect size with additional confounders in order to increase the grading for this factor. Reduction of the grade by reason of risk

of bias (including publication bias), imprecision, inconsistency or indirectness was also not considered necessary, leaving the body of evidence for this factor as “low certainty”.

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Hanson, 1995 (123)	15.2 (12-20)	157	Interview	N	Correlation with child's report of cohesion: r= 0.36	Y	<0.0001	
					Correlation with parent's report of cohesion: r= 0.24	Y	<0.0001	
Pereira, 2008 (136)	15 (10-18)	157	Self-Report Questionnaire on Adherence (Almeida & Pereira, 2003)	N	r= -0.014	N	>0.05	Higher scores in the adherence questionnaire confer to worse adherence, so the negative relationship here should be interpreted as "increasing family cohesion was associated with improved adherence" (though it was not statistically significant).
La Greca, 2002 (134)	14.2 (11-18)	74	Interview (developed by Hanson et al., 1992)	Y	r= 0.32	Y	<0.01	
Hauser, 1990 (162)	12.8	52	Questionnaire (validated by Jacobson et al., 1987)	Y	Correlation with child's report of cohesion: r= -0.37	Y	<0.01	

					Correlation with parent's report of cohesion: r= 0.32	Y	<0.05	
Schafer, 1983 (164)	13 (range 12-14)	34	Barriers to Adherence and Problem-Solving Questionnaire and Summary of Self-Care Activities Questionnaire	Y	r= 0.11	N	>0.05	

Table 3.12 Studies assessing the relationship between perceptions of family cohesion and adherence. Legend; Y; yes, N: no, r: Pearson correlation coefficient value. Statistically significant results that suggest that adherence improves with increasing family cohesion are coloured in green and statistically significant results suggesting that adherence worsens with increasing family cohesion are coloured orange. Results that were not statistically significant have been left white.

3.6.9. Diabetes Knowledge

Four studies (125,156,193,196) assessed the association between diabetes knowledge and adherence. Table 3.13 summarises these studies and their results. Statistically significant results suggesting a positive relationship between diabetes knowledge and adherence have been coloured green. Results that were not statistically significant have been left white.

The studies included 348 children and young people with a mean of 87 children and a range of 36-165.

The four studies used each used a different method of measuring adherence.

2/4 (50%) (193,196) of the studies found that knowledge of diabetes was significantly positively associated with adherence, with one of these studies (193) being the only study that specifically assessed adherence to insulin therapy and expressed these results separately.

1/4 (25%) (125) of these studies found that the correlation (r) between diabetes knowledge and adherence was positive and statistically significant, but the effect size (β) was not statistically significant.

The remaining study (156) did not find a statistically significant association between diabetes knowledge and adherence.

No studies suggested that diabetes knowledge has a negative effect on treatment adherence.

Studies differed considerably in their methods of measuring adherence and sample populations, so meta-analysis was not considered appropriate.

All of the studies assessing the relationship between diabetes knowledge and adherence were observational studies, which according to the GRADE framework (see section 2.2.7), begins the body of evidence at “low certainty”. There were insufficient studies that demonstrated either a large magnitude of effect, a dose-response gradient, or a reduction in the effect size with additional confounders in order to increase the grading for this factor. Reduction of the grade by reason of risk of bias (including publication bias), imprecision, inconsistency or indirectness was also not considered necessary, leaving the body of evidence for this factor as “low certainty”.

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Hanson, 1987 (125)	14.4 (NK)	93	Self-report and observation (Cerkoney and Hart and Schlenk and Hart)	N	r=0.28,	Y	<0.01	
					β= 0.227	N	>0.05	
Brownlee-Duffeck, 1987 (156)	18 (13-26)	54	Diabetes Regimen Adherence Questionnaire (DRAQ)	N	r= 0	N	>0.05	
					β= 0.02	N	>0.05	
Moret, 1995 (193)	10.2 (7-13)	165	Insulin adjustment score	Y	r= 0.47	Y	<0.001	
Olivares, 1994 (196)	10.29 (9.12)	36	Questionnaire (not otherwise specified)	N	t-score= 2.71	Y	<0.05	

Table 3.13 Studies assessing the association between diabetes knowledge and treatment adherence. Legend; Y: Yes, N: No, NK: Not Known, DRAQ: Diabetes Regimen Adherence Questionnaire, r: Pearson correlation value, β: beta-value. Statistically significant results suggesting a positive relationship between diabetes knowledge and adherence have been coloured green. Results that were not statistically significant have been left white.

3.6.10. Exercise Frequency

Four studies (120,121,159,176) assessed the association between exercise frequency and adherence. Table 3.14 summarises these studies and their results. Statistically significant results that suggest adherence improves with exercise frequency are coloured green. Results that were not statistically significant have been left white. Note that two of these studies (120,121) appeared to be from the same data set but have different publication years and methods of publishing their results. They have been included as a single row in the table below but referenced separately.

The four studies included 850 children and young people with a mean of 213 children per study and a range of 105-289. Note that two of these studies appeared to use the same sample; combining these two studies results in a mean of 187 children per study.

One of these studies (159) specifically reported the association with insulin adherence, with the other studies assessing insulin adherence, but reporting their results as a composite index.

3/4 of these studies (75%) (120,121,159) found that exercise was significantly positively associated across all of their assessed domains.

The one remaining study (176) found that exercise at study entry was significantly positively associated with adherence at study entry, but not statistically significant when assessing exercise frequency at study entry with adherence at follow-up and exercise frequency at follow-up with adherence at both study entry and follow-up.

0/4 (0%) studies suggested that exercise frequency was significantly negatively associated with adherence.

Studies differed considerably in their methods of measuring adherence and sample populations, so meta-analysis was not considered appropriate.

All of the studies assessing the relationship between age and adherence were observational studies, which according to the GRADE framework (see section 2.2.7), begins the body of evidence at “low certainty”. There were insufficient studies that demonstrated either a large magnitude of effect, a dose-response gradient, or a reduction in the effect size with additional confounders in order to increase the grading for this factor. Reduction of the grade by reason of risk of bias (including

publication bias), imprecision, inconsistency or indirectness was also not considered necessary, leaving the body of evidence for this factor as “low certainty”.

Study	Mean age (range)	Sample size	Method of measuring adherence	Adherence to insulin therapy specifically assessed and presented separately in results? (Y/N)	Effect on adherence	Statistically significant? (Y/N)	P-value	Comments
Kyngäs, 2000, 2007 (120,121)	15.1 (NK)	289	Questionnaire (not otherwise specified)	N	Of the participants who regularly exercise, 90% were classed as having good adherence, 10% satisfactory adherence and 0% poor adherence Of the participants who occasionally exercise, 68% were classed as having good adherence, 29% satisfactory adherence and 3% poor adherence Of the participants who did not exercise at all, 5% were classed as having goof adherence, 0% as having satisfactory adherence and 95% as having poor adherence	Y	<0.001	The way the levels of "good", "satisfactory" and "poor" adherence were classified was not clear from the study manuscript.
McGrady, 2014 (176)	17.45 (15-20)	105	Self-Care Inventory (SCI)	N	Exercise at study entry (T1) with adherence at T1: 0 .33	Y	<0.001	

					Exercise at T1 with adherence at follow-up (T2): r= 0.11	N	>0.05	
					Exercise at T2 with adherence at T1: r= -0.04	N	>0.05	
					Exercise at T2 with adherence at T2: r= 0.11	N	>0.05	
Peters, 2008 (159)	12.8 (range 8-17)	167	Diabetes Self-Management Profile (DSMP; Harris et al., 2000)	Y	Sample age 8-11: 0.234	Y	<0.01	
					Sample age 12-17: r= 0.219	Y	<0.05	
					Total sample: r= 0.245	Y	<0.05	

Table 3.14 Studies assessing the association between exercise frequency and adherence. Legend; Y: Yes, N: No, T1: Time 1 (study entry), T2: Time 2 (follow-up), SCI: Self-Care Inventory, DSMP: Diabetes Self-Management Profile, r: Pearson correlation coefficient score. Statistically significant results that suggest adherence improves with exercise have been coloured green. Statistically insignificant results were left white.

3.6.11. Less Frequently Assessed Factors

Table 3.15 contains a summary of factors that were assessed by 3 or fewer studies and their correlation with/effect on adherence.

Factor Assessed (number of studies if n>1)	N	Effect on Adherence	Statistically Significant? (Y/N)	Ref
Acceptance	252	Male: r= 0.29	Y	(141)
		Female: r= 0.34	Y	
Achievement striving	28	r= 0.382	N	(142)
Activity level		r= 0.33	N	
ADHD	322	AG: 1.9%, EG: 3%, MG: 4.2%	N	(117)
Adjustment disorder		AG: 1%, EG: 0%, MG: 2.8%	N	
Adolescent diabetes technology index	174	β= 0.23	Y	(158)
Adventurousness	28	r= 0.089	N	(142)
Agoraphobia	322	AG: 1.9%, EG: 4.5%, MG: 2.8%	N	(117)
Agreeableness	28	r= 0.46	N	(142)
Alcohol/drug abuse	322	AG: 0%, EG: 0%, MG: 0%	N/A	(117)
Altruism	28	r= 0.225	N	(142)
Amount of sleep	45	Every 1-minute increase/decrease in sleep resulted in 1.2% increase/decrease in the total number of daily boluses/20 minutes per bolus	Y	(149)
Anger	28	r= -0.542	Y	(142)
Anxiety		r= -0.441	N	
Any psychiatric disorder	322	AG: 17.5%, EG: 29.6%, MG: 46.5%	Y	(117)
Artistic interests	28	r= 0.009	N	(142)
Assertiveness		r= 0.09	N	
Attitude	289	Positive attitude: Good: 31%, satisfactory: 69%, poor: 0%	Y	(120)
		Negative attitude: Good: 0%, satisfactory: 85%, poor: 15%	Y	
Authoritarian family function	70	0.17	N	(160)
Barriers to adherence	34	-0.29	N	(164)

Factor Assessed (number of studies if n>1)	N	Effect on Adherence	Statistically Significant? (Y/N)	Ref
Behavioural intervention	37	Increase in questionnaire score by a mean of 1.0 from pre-test to follow-up	Y	(186)
Behavioural support (child report)	88	Public hospital sample: r=Parent's (P) report on adherence: 0.46, Child's (C) report on adherence: 0.18, Nurse's (N) report on adherence: 0.32. β =P: 0.55, C: 0.23, N: 0.25	P and N reports: Y, C report: N	(140)
		Private hospital sample: r=P: 0.16, C: 0.14, N: 0.15. β =P: 0.27, C: 0.09, N: 0.2.	N	
Behavioural support (parent report)		Public hospital sample: r=P: 0.32, C: 0.4, N: 0.35. β=P: 0.17, C:0.22, N: 0.23	Y	
		Private hospital sample: r=P: 0.05, C: 0.15, N: -0.12. β=P: 0.12, C: 0.03, N: -0.03.	N	
Benefits - costs	56	DRCQ: 0.17	N	(153)
		DSCQ: 0.31	Y	
		CCTI: -0.05	N	
Benefits - costs and threat		DRCQ: -0.38	Y	
		DSCQ: NK	N	
		CCTI: NK	N	
Better parent-child relationship (n=2)	101	r=0.23, β=0.23	Y	(116)
	53	Child's report of adherence: r= 0.49	Y	(192)
		Parent's report of adherence: r= 0.38	Y	
BGM frequency	88	r= 0.24	N	(140)
BGM frequency T1	105	T1: r= 0.26, T2: r= 0.25	Y	(176)
BGM frequency T2		T1: r= 0.21, T2: r= 0.27	Y	
Binging	193	r= -0.36	Y	(146)
BMI (n=2)	241	Group A (compliant group):	N	(144)

Factor Assessed (number of studies if n>1)	N	Effect on Adherence	Statistically Significant? (Y/N)	Ref
		r= -0.19, Group B (intentionally non-compliant group): r= 0.18, Group C (unintentionally non-compliant): r= -0.06		
	75	r= -0.19	N	(155)
Boluses delivered day before clinic visit (designed to assess white coat adherence)	98	Visit 1: r= -0.06	Y	(138)
		Visit 2: r= -0.096	Y	
Boluses delivered day before clinic visit x age		Visit 1: r= 0.0027	Y	
		Visit 2: r= 0.005	Y	
Caregiver education level (n=2)	1028	r= 0.05	N	(145)
	201	MDI: NK	N	(150)
		CSII: NK	N	
Cautiousness	28	0.517	Y	(142)
Cheerfulness		0.156	N	
Child's executive functioning	NK	β= -0.274 (child report of adherence)	Y	(131)
		β= -0.191 (parent report of adherence)	N	
Child's increasing responsibility (n=3)	121	Mother's report of adherence report: r= 0.14	N	(169)
		Child's report of adherence: r= 0.2	Y	
	161	r= 0.19	Y	(148)
	34	r= 0.32	Y	(139)
Clinical/subclinical eating disorders	322	AG: 1.9%, EG: 6%, MG: 12.7%	Y	(117)
Communication	252	Male: r= 0.27	Y	(141)

Factor Assessed (number of studies if n>1)	N	Effect on Adherence	Statistically Significant? (Y/N)	Ref
		Female: r= 0.25	Y	
Compliance in the first 9 months' association with compliance in the second 9 months	57	r= 0.53-0.64	Y	(178)
Conduct disorder	322	AG: 1%, EG: 1.5%, MG: 2.8%	N	(117)
Conscientiousness	28	0.488	Y	(142)
Consequences	64	r= -0.12	N	(135)
Control group vs intervention (trained by professionals who received a communication training plan) group	208	-1.4 score difference control vs intervention group	N	(183)
Co-operation	28	r= 0.324	N	(142)
Coping measures: ego defence level	61	Mean change = -0.05 (with higher ego defence score)	Y	(163)
CSII vs MDI (n=3)	1028	r= 0.18 (CSII better adherence)	N	(145)
	123	Mean difference between scores, MDI vs CSII: 0	N	(128)
	34	"CSII patients had better compliance" (no numerical value stated)	Y	(197)
Cues	56	DRCQ: 0.2	N	(153)
		DSCQ: 0.34	Y	
		CCTI: 0.36	Y	
Cure-control	64	r= 0.41	Y	(135)
Diabetes adjustment (n=2)	57	0-9 months: r= 0.24	N	(178)
		10-18 months: 0.42	Y	

Factor Assessed (number of studies if n>1)	N	Effect on Adherence	Statistically Significant? (Y/N)	Ref
	52	Mean change of 0.27 in adherence score for those deemed to have better adjustment to diabetes	Y	(162)
Diabetes monitoring	252	Male: r= 0.38	Y	(141)
		Female: r= 0.38	Y	
Diabetes Social Support Questionnaire: frequency	74	r= 0.2	N	(134)
Diabetes Social Support Questionnaire: individualised		r= 0.27	Y	
Discipline (child's report)	88	Public: P: 0.23, C: 0.22, N: 0.23. b=P: 0.09, C: 0.14, N: 0.22	N	(140)
		Private: r=P: 0.03, C: 0.1, N: 0.08. b=P: 0.03, C: 0.13, N: 0.08.	N	
Discipline (parent's report)		Public hospital sample: r= P: 0.21, C: 0.08, N: 0.01. b=P: 0.08, C: -0.17, N: -0.22.	N	
		Private hospital sample: r=P: 0.05, C: 0.15, N: -0.12. b=P: -0.02, C:0.12, N: -0.07.	N	
DSMP hypoglycaemia subscale: diet	167	Total sample: 0.403	Y	(159)
		Age 8-11: 0.407	Y	
		Age 12-17: 0.388	Y	
DSMP subscale: glucose testing		Total sample: 0.309	Y	
		Age 8-11: 0.176	N	
		Age 12-17: 0.3	Y	

Factor Assessed (number of studies if n>1)	N	Effect on Adherence	Statistically Significant? (Y/N)	Ref
DSMP subscale: hypoglycaemia management		Total sample: 0.154	Y	
		Age 8-11: 0.061	N	
		Age 12-17: 0.185	Y	
Dutifulness	28	0.419	N	(142)
Dysthymia	322	AG: 0%, EG: 0%, MG: 4.2%	Y	(117)
Eating Attitudes Test 26	75	r= -0.45	Y	(155)
Eating disorders (clinical/subclinical)	322	AG: 1.9%, EG: 6%, MG: 12.7%	Y	(117)
Eating Disorders Inventory - Body Dissatisfaction Scale	75	r= -0.43	Y	(155)
Education group vs positive affect (PA) text message group	48	NK (insignificant)	N	(174)
Education intervention	40	Pre-intervention adherence score: 36.78 (SD 10.12), post -intervention adherence score: 37 (SD 10.26)	Y	(152)
Emergency (hypoglycaemia) precautions at study entry	105	T1: 0.23, T2: 0.12	T1: Y, T2: N	(176)
Emergency (hypoglycaemia) precautions at follow-up		T1: 0.26, T2: 0.33	Y	
Emotional adjustment	28	r= -0.28	Y	(142)
Emotionality	157	0.128	N	(123)

Factor Assessed (number of studies if n>1)	N	Effect on Adherence	Statistically Significant? (Y/N)	Ref
Energy and willpower	289	Has energy and willpower: Good: 39%, satisfactory: 61%, poor: 8%	Y	(120)
		No energy and willpower: Good: 3%, satisfactory: 86%, poor: 11%	Y	
Excitement seeking	28	r= -0.146	N	(142)
Experience of results	289	Positive experience: Good: 26%, satisfactory: 72%, poor: 3%	Y	(120)
		Negative experience: Good: 1%, satisfactory: 83%, poor: 16%	Y	
Expressiveness	NK	r= 0.02	N	(131)
Externalising behaviour	197	r= -0.24	Y	(175)
Extraversion	289	0.151	N	(120)
Family relations	93	r=0.32, β=0.194	r=Y, b=N	(125)
	223	r= 0.64	NK	(127)
Family stress (n=2)	197	Maternal report: r= -0.24	Y	(175)
		Child's report: r= -0.09	N	
	322	Parent's report: β: -0.333	Y	(117)
Family support: affective	157	r= 0.234	Y	(136)
Family support: control		r= 0.148	N	
Family support: indirect		r= 0.144	N	
Family support: no support		r= -0.095	N	
Father negative	34	r= -0.01	N	(164)
Father-absent vs father-present	60	F= 5.75 (better adherence in father-absent adolescents)	Y	(124)

Factor Assessed (number of studies if n>1)	N	Effect on Adherence	Statistically Significant? (Y/N)	Ref
Feel that diabetes affects their mental wellbeing	289	7.68 times more likely to be adherent than those who did not	Y	(121)
Feel that diabetes affects their physical wellbeing		2.95 times more likely to be adherent than those who did not	Y	
Feel that they have support from nurses		6.28 times more likely to be adherent than those who did not	Y	
Feel that they have support from their physician		6.69 times more likely to be adherent than those who did not	Y	
Frequency of alcohol consumption (n=2)	322	Regularly drinks alcohol: Good: 5%, satisfactory: 62%, poor: 33%	Y	(117)
		Occasionally drinks alcohol: Good: 9%, satisfactory: 78%, poor: 13%		
		Doesn't drink alcohol: Good: 68%, satisfactory: 31%, poor: 1%		
	28	NK (insignificant)	N	(142)
Frequency of breakfast	104	r= -0.369	Y	(129)
Frequency of dinner		r= -0.28	Y	
Frequency of evening snack		r= 0.01	N	
Frequency of help	252	Male: 0.04	N	(141)
		Female: 0.12	N (marginal)	
Frequency of lunch	104	r= -0.127	N	(129)
Frequency of mid-afternoon snack		r= -0.019	N	

Factor Assessed (number of studies if n>1)	N	Effect on Adherence	Statistically Significant? (Y/N)	Ref
Frequency of mid-morning snack		r= -0.095	N	
Friendliness	28	0.263	N	(142)
Functional enuresis	64	AG: 3.9%, EG: 1.5%, MG: 2.8%	N	(135)
General monitoring	252	Male: r= 0.46	Y	(141)
		Female: r= 0.26	Y	
Generalised anxiety disorder	28	AG: 0%, EG: 0%, MG: 1.4%	N	(142)
Gregariousness	34	r= 0.072	N	(164)
HBM: Benefits	54	r=0.02, β=0.32	N	(156)
HBM: costs		r=0.25, β =-1.19	N	
HBM: cues to action		r=0, β =-0.43	N	
HBM: Susceptibility		r=0.01, β =-0.29	Y	
Health Belief Model (HBM): Severity		r=0, β =0.07	Y	
HFS: Behaviour	76	Boys: r= 0.12	N	(157)
		Girls: r= 0.15	N	
HFS: worry/fear		Boys: r= -0.5	Y	
		Girls: r= -0.02	N	
Household income (n=3)	101	r= 0.04	N	(116)
	1028	r= 0.18	Y	(145)
	174	β= 0.08	N	(158)
Identity	28	r= -0.24	N	(142)
Imagination		-0.183	N	
Immigrant vs French Native mother: General insulin adherence	165	Immigrant mother score: 3.9, French native mother score: 4.6	Y	(147)
Immigrant vs French Native mother:		Immigrant mothers: 29.2%, Native French mother: 62%	Y	

Factor Assessed (number of studies if n>1)	N	Effect on Adherence	Statistically Significant? (Y/N)	Ref
Percentage that adjust insulin dose during illness:				
Impulsiveness	28	-0.348	N	(142)
Increased disease severity (n=3)	101	r= -0.22, b= -0.2	Y	(116)
	161	r= -0.16	N	(148)
	54	r=0, β=0.07	N	(156)
Increased severity of risks	101	r=0.21, b=0.3	Y	(116)
Increased treatment complexity		r= -0.17	N	
Increased vulnerability to risks		r=-0.01, b=-0.14	N	
Increasing lack of responsibility from mother or child	121	Mother's (M) report of adherence: -0.23, Child's (C) report of adherence: -0.06	M report: Y, C report: N	(169)
Independence	70	r= -0.05	N	(160)
Independence and encouragement	252	Male: r= 0.27	Y	(141)
		Female: r= 0.28	Y	
Insulin dosage calculator use: control group (manual calculations)	83	Average adherence score change after 6 months: +0.29	Y	(182)
Insulin dosage calculator use: inconsistent		Average adherence score change after 6 months: +0.56	Y	
Insulin dosage calculator use: regular		Average adherence score change after 6 months: +0.12	N	
Intellect	28	r= 0.005	N	(142)

Factor Assessed (number of studies if n>1)	N	Effect on Adherence	Statistically Significant? (Y/N)	Ref
Intensity of insulin regimen (2 vs 4 injections per day)	89	No correlation	N	(167)
Internalising behaviour	252	r= -0.11	N (marginal)	(141)
Intervention group (12 play sessions) vs control group	30	Post-test: 0.156	N	(185)
Intervention group (monthly diabetes education session) vs control group	503	Intervention pre-test: 89.66	Y	(184)
		Intervention post-test: 94.4		
		Control pre-test: 63.9		
		Control post-test: 51.23		
Intrusive support	252	Male: 0.1	N	(141)
		Female: 0.14	Y	
Liberalism	161	0.21	N	(148)
Locus of control	57	0-9 months: r= 0.24	N	(178)
		10-18 months: r= 0.34	Y	
Locus of control: chance	174	r= -0.06	N	(158)
Locus of control: internal		r= 0.17	N	
Locus of control: powerful others		r= 0.18	N	
Maternal Involvement: child's report	82	P report T1: r= 0.09. C report T1: r= 0.05. P report T2: r= 0.18. C report T2: r= 0.04.	N	(177)

Factor Assessed (number of studies if n>1)	N	Effect on Adherence	Statistically Significant? (Y/N)	Ref
Maternal Involvement: Mother's report		P report T1: r= 0.03. C report T1: r= 0.01. P report T2: r= 0.17. C report T2: r= -0.06.	N	
Mean daily blood glucose	91	r= -0.428	Y	(151)
Mean diabetes-specific stress (DSS) severity	175	r= -0.11	N	(173)
Method of insulin delivery	207	Inhaled insulin usability score: 74.2, S/C insulin usability score: 67	Y	(179)
Modesty	28	r= 0.13	N	(142)
Morality		r= 0.603	Y	
Mother negative	34	-0.14	N	(164)
Mother report of social functioning	57	0-9 months: 0.45, 10.25	Y	(178)
		10-18 months: 0.43, 9.37	Y	
Mother's age	88	r= -0.07	N	(154)
Mother's education		0.13	N	
Mother's increasing responsibility for management of daily regimen tasks	121	Mother's report of adherence: r= -0.01, Child's report of adherence: r= 0.08	N	(169)
Mother's increasing responsibility for management of general health		Mother's report of adherence: r= 0, Child's report of adherence: r= 0.17	N	
Mother's increasing responsibility for social presentation (talking to family and		Mother's report of adherence: r=: -0.16, Child's report of adherence: r= -0.02	N	

Factor Assessed (number of studies if n>1)	N	Effect on Adherence	Statistically Significant? (Y/N)	Ref
friends about disease etc.)				
Mother's sense of empowerment	88	0.2	Y	(154)
Motivation level	289	Good motivation: Good: 39%, satisfactory: 61%, poor: 0%	Y	(120)
		No motivation: Good: 2%, satisfactory: 83%, poor: 15%	Y	
Negative communication	75	r= -0.39	Y	(155)
Negotiated Telephone Support	91	Adherence score mean change: 4.81 (SD 10.74). Barriers to Adherence mean change: 4.12 (SD 21.7)	N	(180)
Negotiated Telephone Support, yearly clinical review, 3-monthly measurement of HbA1c		Adherence score mean change: 7.32 (SD 9.1). Barriers to Adherence mean change: -0.64 (SD 11.9)	N	
Neuroticism	322	r= -0.505	Y	(117)
Non-supportive family		r= -0.29	Y	
Non-white adolescent		β= -0.13	N	
Number of adverse life events	178	0-1 adverse life events: Mean adherence score, C report: 75. P report: 74. 2-3 adverse life events: Mean adherence score, C report: 71. P report: 71. 4+ adverse life events: Mean adherence score, C report: 68. P report: 68.	Y	(118)
Number of children in family	88	r= 0.03	N	(154)

Factor Assessed (number of studies if n>1)	N	Effect on Adherence	Statistically Significant? (Y/N)	Ref
Number of hospital admissions	89	No correlation	N	(167)
OCD	322	AG: 0%, EG: 3%, MG: 1.4%	N	(117)
Openness to experience	28	r= 0.051	N	(142)
Oppositional defiant disorder	57	AG: 1.9%, EG: 0%, MG: 5.6%	N	(178)
Orderliness	28	-0.018	N	(142)
Overall QoL	76	Boys: r= -0.44	Y	(157)
		Girls: r= -0.09	N	
Parent perception of control	52	r= -0.12	N	(162)
Parent perception of family organisation		r= 0.21	N	
Parent perception of independence		r= 0.04	N	
Parental marital status	201	MDI: NK	N	(150)
		CSII: NK	N	
Parents' health literacy	93	r = 0.2	N	(172)
Parents perceptions of expressiveness	52	0.16	N	(162)
Parents' reading comprehension (intensive insulin regimen); P report on adherence	93	Parents' report on adherence: r = 0.31, child's report on adherence: r = 0.32	Y	(172)
Patient perception of control	52	-0.05	N	(162)
	34	r= -0.1	N	(164)

Factor Assessed (number of studies if n>1)	N	Effect on Adherence	Statistically Significant? (Y/N)	Ref
Patient perceptions of family organisation (n=3)	157	r= 0.053	N	(136)
	52	r= 0.25	N	(162)
Patient perception of independence		r= 0.16	N	
Patient perceptions of expressiveness		r= 0.17	N	
Perceived barriers to site rotation	201	MDI: r= -0.28	Y	(150)
		CSII: r= -0.21	N	
Perceived competence	57	0-9 months: r= 0.22; 10-18 months: r= 0.3	N	(178)
Perceived impact (n=2)	105	T1: 0.01, T2: -0.03	N	(176)
	76	Boys: r= -0.38	Y	(157)
		Girls: r= -0.11	N	
Perceived level of hope	90	r= 0.26	Y	(132)
Perceived threat (n=2)	105	T1: r= -0.22, T2: r=-0.16	T1: Y, T2: N	(176)
	56	DRCQ: r= -0.08	N	(153)
		DSCQ: r= -0.05	N	
		CCTI: r= 0.09	N	
Presence of co-morbidities	57	Yes: 27.8% of non-adherence	N	(166)
		No: 72.2% of non-adherence	N	
Presence of threat to emotional well-being	289	No threat to emotional well-being: Good: 29%, satisfactory: 66%, poor: 5%	Y	(120)
		Threat to emotional well-being: Good: 7%, satisfactory: 85%, poor: 8%	Y	
Presence of threat to physical well-being		No threat to physical well-being: Good: 90%, satisfactory: 10%, poor: 0%	Y	

Factor Assessed (number of studies if n>1)	N	Effect on Adherence	Statistically Significant? (Y/N)	Ref
		Threat to physical well-being: Good: 2%, satisfactory: 143%, poor: 0%	Y	
Presence of threat to social wellbeing		No threat to social well-being: Good: 36%, satisfactory: 64%, poor: 0%	Y	
		Threat to social well-being: Good: 3%, satisfactory: 82%, poor: 15%	Y	
Psychosis	201	AG: 0%, EG: 0%, MG: 0%	N/A	(150)
PTSD		AG: 0%, EG: 4.5%, MG: 1.4%	N	
PTSD diagnosis of mother	60	Overall: r = -0.115, aged 0-8: r = -0.519, aged 9-16: r = 0.062	N	(171)
QoL (with number of injections per day)	503	chi-squared value: 6.73	Y	(184)
QoL: Diabetes worry	76	Boys: r= -0.24	N	(157)
		Girls: r= -0.14	N	
QoL: Satisfaction		Boys: r= -0.42	Y	
		Girls: r= -0.12	N	
QoL: Social worry		Boys: r= -0.3	N	
		Girls: r= 0	N	
Race	57	Malaysian: 35.2% of non-adherence	N	(166)
		Chinese: 51.9% of non-adherence	N	
		Indian: 11.1% of non-adherence	N	
		Other: 1.9% of non-adherence	N	
Recent change in insulin dose		Yes: 70.4% of non-adherence	N	
		No: 29.6% of non-adherence	N	
Regular Use of I-Port	55	Mean number of missed insulin doses in past three months down to 0.26 (SD 0.81) from 1.1 (SD 1.81)	Y	(170)

Factor Assessed (number of studies if n>1)	N	Effect on Adherence	Statistically Significant? (Y/N)	Ref
Report of symptoms (from child)	322	0-9 months: r= 0.22	N	(117)
		10-18 months: r= 0.32	Y	
Report of symptoms (from mother)		0-9 months: r= 0.3	Y	
		10-18 months: r= 0.33	Y	
Response costs	101	r=-0.45, β=- 0.36	Y	(116)
Response efficacy		r=0.3, β= 0.18	Y	
School/work performance	223	r= 0.66	NK	(127)
Self-consciousness	28	r= -0.133	N	(142)
Self-discipline		r= 0.482	Y	
Self-report on adherence to BGM	88	r= 0.24	N	(140)
Self-report on adherence to meals		r= -0.27	N	
Self-report on adherence to snacks		r= 0.11	N	
Sense of normality	289	Strong sense of normality: Good: 29%, satisfactory: 71%, poor: 0%	Y	(120)
		Poor sense of normality: Good: 3%, satisfactory: 80%, poor: 17%	Y	
Separation anxiety disorder	88	AG: 1%, EG: 3%, MG: 4.2%	N	(154)
Single parent household vs both parents (n=2)	NK	t-score= -2.38 (worse adherence in single-parent households)	Y	(131)
	1028	r= 0.08 (better adherence in two-parent households)	N	(145)
Smoking frequency (n=2(	289	Regularly smokes: Good: 0%, satisfactory: 84%, poor: 16%	Y	(120)

Factor Assessed (number of studies if n>1)	N	Effect on Adherence	Statistically Significant? (Y/N)	Ref
		Occassionally smokes: Good: 2%, satisfactory: 91%, poor: 7%	Y	
		Doesn't smoke: Good: 64%, satisfactory: 35%, poor: 11%	Y	
	197	r= -0.08	Y	(175)
Sociability scores	223	r= 0.46	NK	(127)
Social anxiety	76	Boys: r= -0.39	Y	(157)
		Girls: r= 0.21	N	
Social competence (n=2)	93	r=0.25, β=-0.067	r=Y, b=N	(125)
	104	r= 0.2	Y	(126)
Social phobia	322	AG: 0%, EG: 1.49%, MG: 7%	Y	(117)
Socio-economic status (n=3)	104	Lower socioeconomic status related to poorer adherence; no numerical figure given	Y	(126)
	93	r= -0.14	N	(125)
	157	β= 0.178 (higher class confers to better adherence)	Y	(136)
Specific (isolated) phobias	175	AG: 2.9%, EG: 9%, MG: 21.1%	Y	(173)
Stress (n=3)	56	r= -0.08	N	(153)
	64	r=-0.11, β=-0.033	N	(135)
	174	r= -0.09	N	(158)
Support from friends	74	r= 0.05	N	(133)
Support from nurses	289	Has support from nurses: Good: 37%, satisfactory: 63%, poor: 0%	Y	(120)
		No support from nurses: Good: 1%, satisfactory: 85%, poor: 14%	Y	
Support from physicians		Has support from physicians: Good: 39%, satisfactory: 61%, poor: 0%	Y	

Factor Assessed (number of studies if n>1)	N	Effect on Adherence	Statistically Significant? (Y/N)	Ref
		No support from physicians: Good: 7%, satisfactory: 87%, poor: 12%	Y	
"Sweet talk" text message intervention (conventional insulin therapy)	90	Self-reported adherence score increased by 6.8 compared to the group receiving no intervention	Y	(181)
Sympathy	28	0.205	N	(142)
Teacher victimisation	167	Total sample: -0.135	N	(159)
		Age 8-11: -0.343	Y	
		Age 12-17: -0.112	N	
Threat	174	DRCQ: r= -0.08	N	(158)
		DSCQ: r= -0.05	N	
		CCTI: r= 0.09	N	
Timeline		r= 0.18	N	
Total DSMP score	167	Total sample: r= 0.65	Y	(159)
		Age 8-11: r= 0.667	Y	
		Age 12-17: r= 0.629	Y	
Total HFS	76	Boys: r= -0.38	Y	(157)
		Girls: r= 0.04	N	
Total meals	104	r= -0.332	Y	(129)
Treatment effectiveness: control	105	T1: r= 0.12, T2: r= 0.15	N	(176)
Treatment effectiveness: prevent		T1: r= 0.08, T2: r= 0.24	T1 : N, T2: Y	
Trust	28	r= 0.382	N	(142)
Type of insulin pen	116	Solostar pen: Percentage of participants completing all tasks successfully: 98%	Y	(119)
		FlexPen: Percentage of participants completing all tasks successfully: 97%	Y	

Factor Assessed (number of studies if n>1)	N	Effect on Adherence	Statistically Significant? (Y/N)	Ref
		Lilly Disposable Pen: Percentage of participants completing all tasks successfully: 72%	N	
		Pen X: Percentage of participants completing all tasks successfully: 79%	N	
Uses diabetes apps	174	β= 0.12	N	(158)
Uses diabetes websites		β= 0.15	Y	
Uses meter/pump software	88	β= 0.15	Y	(140)
Uses social networking	157	β= 0.18	Y	(136)
Uses text messaging	52	β= 0.11	N	(162)
Utilising personal and interpersonal resources coping strategy	135	r= -0.055	N	(122)
Ventilation and avoidance coping strategy		r= -0.367	Y	
Vulnerability	28	r= -0.378	N	(142)
Warmth (child's report)	34	Public hospital group: r=Parent's (P) report of adherence: 0.4, Child's (C) report of adherence: 0.35, Nurse's (N) report of adherence: 0.37. b=P: 0.02, C: 0.11, N: 0.22.	Y	(164)
		Private hospital group: r=P: 0.03, C: 0.19, N: 0.03. b=P: -0.16, C: 0.05, N: -0.13	N	
Warmth (parent's report)		Public hospital group: r=P: 0.55, C: 0.48, N: 0.35. b=P: 0.35, C:0.36, N: 0.29.	Y	

Factor Assessed (number of studies if n>1)	N	Effect on Adherence	Statistically Significant? (Y/N)	Ref
		Private hospital group: r=P: 0.2, C: 0.13, N: -0.17. b=P: 0.11, C: 0.08, N: -0.14.	N	

Table 3.15 Summary of factors that were assessed by 3 or fewer studies. Legend; N: sample size, n: number of studies, C: child, P: parent, N: nurse, r: correlation, β: beta-value, Y: yes, N: no, DSMP: Diabetes Self-Management Profile, HFS: Hypoglycaemia Fear Score, AG: Agreement Group, EG: Error Group, MG: Management Group, DRCQ: Diabetes Regimen Compliance Questionnaire, DSCQ: Diabetes Self-Care Activities Questionnaire, CCTI: Child Compliance Telephone Interviews, CSII: Continuous Subcutaneous Insulin Infusion, MDI: Multiple Daily Injections. Those in the "Agreement Group" were deemed as being compliant. Those in the "Error Group" were deemed as being intentionally non-compliant. Those in the "Management Group" were deemed as being unintentionally non-compliant. Groups A and B were statistically identical samples drawn from two different populations.

3.6.12. Agreement of Studies

Table 3.16 contains the factors that were assessed more than once and summarises the agreement of the results of these studies.

Studies were deemed as having results of "mixed significance" if they assessed the factor in multiple domains (and published these domains separately), with some of them being statistically significant and others not significant. For example, they assessed the factor's effect upon adherence in boys and girls, but the effect was only significant in boys. This includes studies with a significant correlation (r) but a not significant effect size (β). For a study's results to be deemed as showing a positive or negative relationship, it would need to demonstrate this same relationship across all of its assessed domains; this includes studies that only assessed a single domain.

Each factor was colour coded according to the predominant result. If the predominant result suggested a positive relationship between the factor and adherence, it was coloured dark green (strong agreement of studies). If there were an equal number of results suggesting a positive relationship and not significant/mixed significance results, it was coloured light green (relative agreement of studies). If the predominant result was not statistically significant/of mixed significance, the result was left white. If there were an equal number of results suggesting a negative relationship and not significant/mixed significance results, it was coloured orange (relative agreement of studies). If the predominant result suggested a negative relationship, it was coloured red (strong agreement of studies).

There were no factors that had an even split of studies suggesting significant positive and negative relationships.

For single-parent versus dual-parent households, the light green colouration indicates an even number of studies suggesting adherence was better in dual-parent households and those suggesting a not significant/mixed significance relationship.

Factor	Number of Studies	Percentage	References
Age	Positive relationship: 2/33	6.06%	(116,122,123,125,128, 132–134,136–138,140,143–145,148,150,151,153, 154,156,158,160,163, 165–169,177,178,192,193)
	Negative relationship: 22/33	66.66%	
	Results not statistically significant: 7/33	21.21%	
	Results of mixed significance: 2/33	6.06%	
Glycaemic Control	Positive relationship: 15/20	75%	(121,123,125,126,128, 132,135,137,139–141,144,145,151,154, 155,159,160,173,176)
	Negative relationship: 0/20	0%	
	Results not statistically significant: 3/20	15%	
	Results of mixed significance: 2/20	10%	
Duration of Diabetes	Positive relationship: 0/19	0%	(116,120–123,128,131,133,136, 144,145,148,150,154, 158,160,163,169,178)
	Negative relationship: 9/19	47.37%	
	Results not statistically significant: 10/19	52.63%	
	Results of mixed significance: 0/19	0%	
Gender	Better adherence in males: 5/15	33.33%	(128,133,136,144,145, 154,160,161,164,166–169,178,192)
	Better adherence in females:1/15	6.67%	
	Results not statistically significant: 9/15	60%	
	Results of mixed significance: 0/15	0%	
Family Conflict	Positive relationship: 0/8	0%	(123,136,140,151,160, 162,164,192)
	Negative relationship: 1/8	12.5%	
	Results not statistically significant: 3/8	37.5%	
	Results of mixed significance: 4/8	50%	
Depression (in the child/young person)	Positive relationship: 0/7	0%	(117,132,142,146,151, 173,195)
	Negative relationship: 7/7	100%	
	Results not statistically significant: 0/7	0%	
	Results of mixed significance: 0/7	0%	
Self-Efficacy	Positive relationship: 5/7	71.42%	(116,135,141,142,146, 148,160)
	Negative relationship: 0/7	0%	
	Results not statistically significant: 1/7	14.29%	
	Results of mixed significance: 1/7	14.29%	
Family Support	Positive relationship: 5/7	71.42%	(120,126,133,134,136, 148,164)
	Negative relationship: 0/7	0%	
	Results not statistically significant: 2/7	28.57%	
	Results of mixed significance: 0/7	0%	
Family Cohesion	Positive relationship: 2/5	40%	(123,134,136,162,164)
	Negative relationship: 0/5	0%	
	Results not statistically significant: 2/5	40%	
	Results of mixed significance: 1/5	20%	
Diabetes Knowledge	Positive relationship: 2/4	50%	(125,156,193,196)
	Negative relationship: 0/4	0%	
	Results not statistically significant: 1/4	25%	
	Results of mixed significance: 1/4	25%	
Exercise Frequency	Positive relationship: 3/4	75%	(120,121,159,176)
	Negative relationship: 0/4	0%	
	Results not statistically significant: 0/4	0%	
	Results of mixed significance: 1/4	25%	
	Positive relationship: 2/3	66.67%	(139,148,169)
	Negative relationship: 0/3	0%	

Factor	Number of Studies	Percentage	References
Child's Increasing Responsibility	Results not statistically significant: 1/3	33.33%	
	Results of mixed significance: 0/3	0%	
CSII vs MDI	Better adherence with MDI: 0/3	0%	(128,145,197)
	Better adherence with CSII: 1/3	33.33%	
	Results not statistically significant: 2/3	66.67%	
	Results of mixed significance: 0/3	0%	
Disease Severity	Positive relationship: 0/3	0%	(116,148,156)
	Negative relationship: 1/3	33.33%	
	Results not statistically significant: 2/3	66.67%	
	Results of mixed significance: 0/3	0%	
Household Income	Positive relationship: 1/3	33.33%	(116,145,158)
	Negative relationship: 0/3	0%	
	Results not statistically significant: 2/3	66.67%	
	Results of mixed significance: 0/3	0%	
Socio-Economic Status	Positive relationship: 2/3	66.67%	(125,126,136)
	Negative relationship: 0/3	0%	
	Results not statistically significant: 1/3	33.33%	
	Results of mixed significance: 0/3	0%	
Stress	Positive relationship: 0/3	0%	(135,153,158)
	Negative relationship: 0/3	0%	
	Results not statistically significant: 3/3	100%	
	Results of mixed significance: 0/3	0%	
Better Parent-Child Relationship	Positive relationship: 2/2	100%	(116,192)
	Negative relationship: 0/2	0%	
	Results not statistically significant: 0/2	0%	
	Results of mixed significance: 0/2	0%	
BGM Frequency	Positive relationship: 1/2	50%	(140,176)
	Negative relationship: 0/2	0%	
	Results not statistically significant: 1/2	50%	
	Results of mixed significance: 0/2	0%	
BMI	Positive relationship: 0/2	0%	(144,155)
	Negative relationship: 0/2	0%	
	Results not statistically significant: 2/2	100%	
	Results of mixed significance: 0/2	0%	
Caregiver Education Level	Positive relationship: 0/2	0%	(145,150)
	Negative relationship: 0/2	0%	
	Results not statistically significant: 2/2	100%	
	Results of mixed significance: 0/2	0%	
Diabetes Adjustment	Positive relationship: 1/2	50%	(162,178)
	Negative relationship: 0/2	0%	
	Results not statistically significant: 0/2	0%	
	Results of mixed significance: 1/2	50%	
Family Relations	Positive relationship: 0/2	0%	(125,127)
	Negative relationship: 0/2	0%	
	Results not statistically significant: 1/2	50%	
	Results of mixed significance: 1/2	50%	
Family Stress	Positive relationship: 1/2	50%	(117,175)
	Negative relationship: 0/2	0%	

Factor	Number of Studies	Percentage	References
	Results not statistically significant: 0/2	0%	
	Results of mixed significance: 1/2	50%	
Frequency of Alcohol Consumption	Positive relationship: 0/2	0%	(117,142)
	Negative relationship: 1/2	50%	
	Results not statistically significant: 1/2	50%	
	Results of mixed significance: 0/2	0%	
Perceived Impact	Positive relationship: 0/2	0%	(157,176)
	Negative relationship: 0/2	0%	
	Results not statistically significant: 1/2	50%	
	Results of mixed significance: 1/2	50%	
Perceived Threat	Positive relationship: 0/2	0%	(153,176)
	Negative relationship: 0/2	0%	
	Results not statistically significant: 1/2	50%	
	Results of mixed significance: 1/2	50%	
Single vs Dual-Parent Household	Adherence better in single-parent household: 0/2	0%	(131,145)
	Adherence better in dual-parent household: 1/2	50%	
	Results not statistically significant: 1/2	50%	
	Results of mixed significance: 0/2	0%	
Smoking Frequency	Positive relationship: 0/2	0%	(120,175)
	Negative relationship: 2/2	100%	
	Results not statistically significant: 0/2	0%	
	Results of mixed significance: 0/2	0%	
Social Competence	Positive relationship: 1/2	50%	(125,126)
	Negative relationship: 0/2	0%	
	Results not statistically significant: 0/2	0%	
	Results of mixed significance: 1/2	50%	

Table 3.16 Factors assessed by multiple studies and the agreement of those studies. Legend; CSII: Continuous Subcutaneous Insulin Infusion, MDI: Multiple Daily Injections, BMI: Body Mass Index. Colour coding: dark green: predominant result suggests a positive relationship, light green: equal number of results suggesting a positive relationship and not significant/mixed significance results, white: predominant result is lack of statistical significance and/or mixed significance, orange: equal number of results suggesting a negative relationship and not significant/mixed significant results, red: predominant result suggests a negative relationship.

3.7. Secondary Outcomes

3.7.1. Reasons for Non-Adherence

One of the secondary outcomes of this study was to find some of the common reasons for non-adherence as reported by children and young people and/or their parents.

The 4 studies (117,130,139,140) reported 22 reasons for non-adherence. No two studies assessed the same reason.

Two studies (117,140) compared the reported reasons in CSII users versus MDI users. One of these 2 studies (140) was specifically asking for reasons that the child did not rotate their injection site.

One study (130) sorted participants into two groups (A and B) and asked for their reasons for non-adherence. There were no clear differences between these two groups.

One study (139) simply reported the percentage of their sample that reported a given reason.

Table 3.17 summarises the findings of these studies.

Reported Reason	Percentage of Sample Reporting Given Reason	Ref
Comfort with existing routine	MDI users: 49%, CSII users: 64%	(117)
Counting exchanges difficulties	A: 15%, B: 7%	(130)
Denial: wants to be like others, does not admit to being diabetic	26.50%	(139)
Diabetes misunderstanding	A: 23%, B: 36%	(130)
Eating many meals	A: 18%, B: 28%	
Estimation of food difficulties	A: 23%, B: 28%	
Fear of hypoglycaemia	A: 50%, B: 39%	
Feels bad; disease is responsible	17.60%	
Frequent blood monitoring	A: 24%, B: 25%	
Frequent infections	A: 24%, B: 23%	
Hedonism: Hungry or not hungry, concerned about weight, too much bother	35.30%	(139)
Interpersonal reasons: peer pressure, rebelling against parents	17.60%	
Lack of time	A: 26%, B: 18%	(130)
New sites would be painful	MDI: 49%, CSII: 64%	(140)
Parents' tiredness	A: 50%, B: 55%	(130)
Poor material conditions	A: 20%, B: 28%	
Problems with care at kindergarten/school	A: 32%, B: 37%	
Shame of diabetes	A: 6%, B: 3.5%	
Snacking without parents' permission	A: 17%, B: 43%	
Stress related pain	A: 36%, B: 39%	
Stubborn, lazy, careless	38.20%	(139)
Taking care of other children	A: 17%, B: 16%	(130)

Table 3.17 Reported reasons for non-adherence. Legend; MDI: Multiple Daily Injection, CSII: Continuous Subcutaneous Insulin Infusion, A: group A, B: group B.

4. Thematic Analysis

Across the 5 identified themes:

- 12 of the factors identified were relating to demographics
- 4 were related to past medical history.
- 32 were factors related to diabetes management and diabetes test results
- 159 were psycho-social factors and
- 29 were factors related to family dynamics.

Demographic factors were assessed in 38 studies with a total of 5 415 children and young people. This is a mean of 143 children per study, with a range of 31 to 1 028. The 38 studies used a total of 26 different measures of adherence.

Factors relating to past medical history were assessed in 2 studies with a total of 146 children and young people, with 57 in one study and 89 in the other. Both studies used MPR as their measure of adherence.

Factors relating to diabetes management were assessed in 31 studies with a total of 4 607 children and young people. This is a mean of 149 children per study, with a range of 31 to 1 028. The 31 studies used a total of 21 different measures of adherence.

Psycho-social factors were assessed in 54 studies with a total of 6 534 children and young people. This is a mean of 121 children per study with a range of 34 to 503. The 54 studies used a total of 33 different measures of adherence.

Factors relating to family dynamics were assessed in 21 studies with a total of 2 840 children and young people. This is a mean of 135 children per study with a range of 34 to 1 028. The 21 studies used a total of 16 different measures of adherence.

The variability between themes is illustrated as a bar chart in Figure 4.1.

Despite being the theme with the second-fewest number of individual factors (with 12), demographic factors were assessed in the second highest number of children. This is likely as a result of age being the most frequently assessed factor, being a variable in 33 studies. It is also the theme

with the greatest proportion of its factors being assessed by multiple studies, with 6/12 (50%) featuring in 2 or more studies.

Past medical history was the least assessed theme, with its four factors appearing between two studies. Just one of the four factors (BMI) was assessed in both studies, with both studies finding the effect upon adherence to be not statistically significant.

The second most commonly assessed factor across all studies was HbA1c/glycaemic control, which is in the diabetes management theme. Though it is a frequently assessed factor, it is the only factor that is definitively the result of adherence and not the other way around. While assessing HbA1c has limited usefulness when trying to identify factors that affect adherence, it may still be useful to measure to correlate improved adherence with improved glycaemic control, to highlight that this area of research can have significant physiological implications. The remaining factors were assessed fairly heterogeneously, with just 3/31 (9.7%) being assessed by multiple studies. Of these three factors, diabetes knowledge and BGM frequency had a potential positive correlation with adherence to insulin, with all studies finding a positive correlation, but only some of the studies finding the relationship to be statistically significant.

While the psycho-social theme was the most assessed theme, in terms of number of factors and total number of children, it was also the theme that had the lowest proportion of its factors assessed by multiple studies, with only 11/159 (6.9%) of psycho-social factors being assessed in 2 or more studies. Of these factors, exercise frequency and self-efficacy displayed some of the greatest agreement between studies regarding their effect, with 5/7 (71.42%) of studies assessing self-efficacy and 3/4 (75%) of studies assessing exercise frequency finding that they were significantly associated with adherence. The only factor with unanimous agreement between studies (assessed by 4 or more studies) was a psycho-social factor, that being depression.

Of the factors that were assessed multiple times, 6/7 (85.7%) of family dynamics factors were assessed by studies either in relative or strong agreement regarding the nature of the relationship between the factor and adherence (see section 3.6.12), which was the highest level of agreement of all themes.

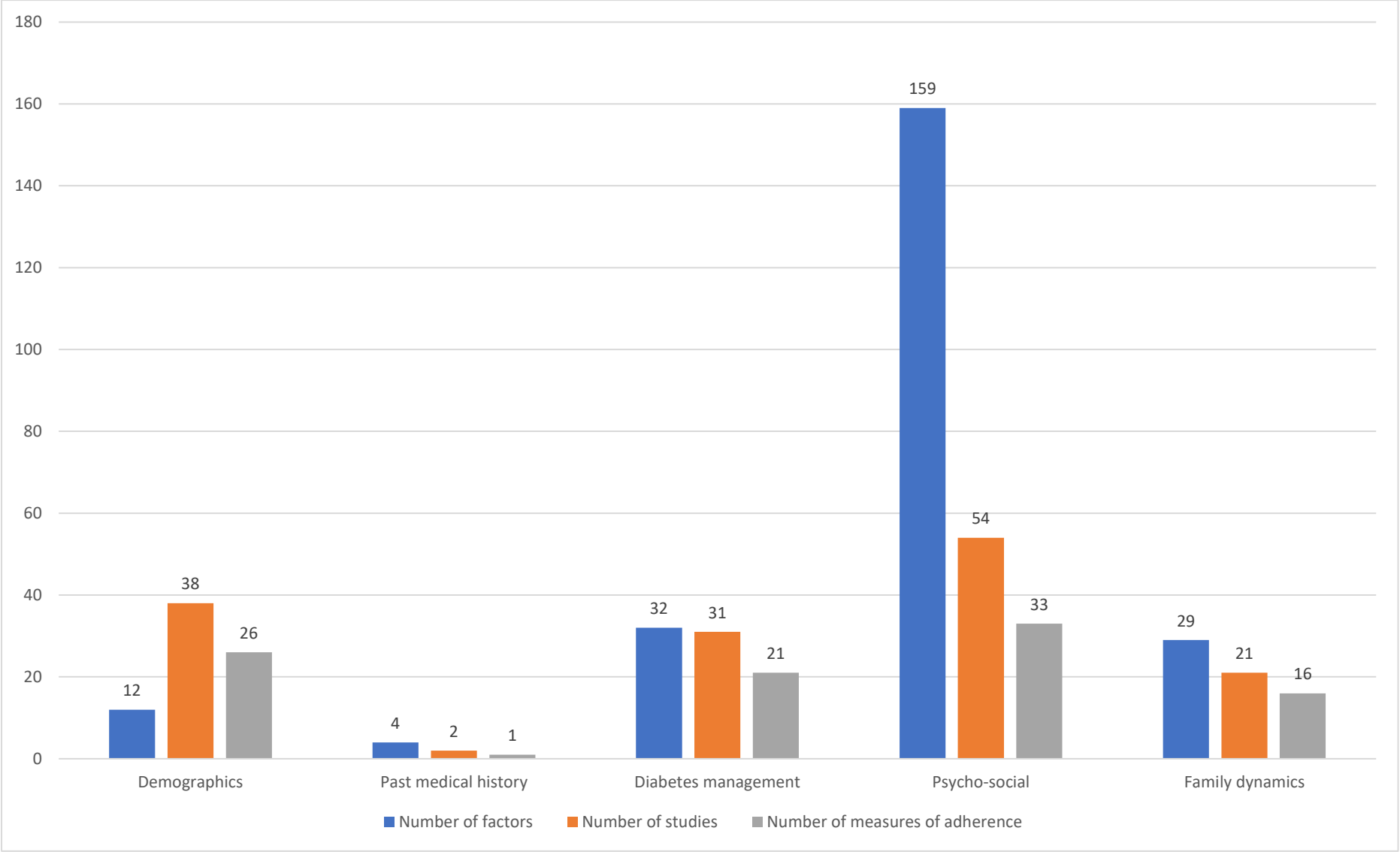

Figure 4.1 Variability between themes.

5. PENDANT Study

5.1. Introduction

As explored in previous sections, there are many things that can affect treatment adherence in children and young people with diabetes, with many of the assessed factors relating to the psychology of children and young people. A new diagnosis of diabetes especially can have significant psychological effects on both the patient and the patient's parents (198) (199).

As well as the event of a new diagnosis being directly stressful to the patient and their parents, poor mental health in parents have been associated with increased risk of poor mental health in their children (200).

Mental health is an important consideration in the management of diabetes, as it can exert both direct effects upon their glycaemic control (199) as well as indirect effects through poorer adherence to treatment (201).

Glycaemic control is the best predictor of long-term outcomes in diabetes, with the risk of all complications being reduced with better glycaemic control (77).

This study was set-up prior to the development of the systematic review contained within sections 2, 3 and 4, based on an *a priori* hypothesis from the local diabetes and diabetes psychology team that the psychological impact of a new diagnosis of diabetes was correlated with later treatment adherence. As the systematic review carried out shows, there are currently no data on the psychological impact on children and their families of the diagnosis of T1DM, with current research examining those with already established disease, so this study was set up to try and support this hypothesis.

Given that the psychology of parents and their child can both directly affect glycaemic control and indirectly affect glycaemic control (through reduced treatment adherence) and that reduced treatment adherence can result in worse glycaemic control - which is the best predictor of long-term outcomes - a better understanding of the psychological stressors that children and their families face could not only improve their quality of life, but also have significant long-term physiological benefits.

5.2. Protocol

The study protocol was written by a consultant paediatrician with extensive academic experience (DH) and a consultant paediatric diabetologist (MD) with assistance from a paediatric clinical psychologist (LC) who works with children and young people with diabetes.

My contribution to the protocol was making the amendments to it and supporting documentation, including writing new patient information leaflets (PISs) for different age groups in order to gain the initial ethical approval, as well as making the later ethical amendments as detailed in section 5.4. The PIS for the youngest patients (aged 3-6) and the PIS for parents can be found in Figure 5.1 and Figure 5.2, respectively, to illustrate the different ways study information was communicated to prospective participants. There were also versions for older children, adolescents, and participants competent to consent (aged 16-18) which can be found in Appendix 11, Appendix 12 and Appendix 13, respectively. I was also responsible for creating the study master file, creation of the case record form (CRF), creation of the database to input data, recruiting patients, issuing the questionnaires, and analysing them once completed.

PENDANT study

A study to establish if there is a relationship between how unwell children and young people are when diagnosed with Type 1 Diabetes, and how well they manage later on

Information leaflet for young participants (aged 3-6)

What is this about?

We want to get you and your family's help. We don't yet understand how much your new condition (Diabetes) has changed your life. Or how it has changed your family's life. We want to learn about this.

Why you?

You have recently found out that you have Type 1 Diabetes and go to Alder Hey.

What will happen?

We would like to ask you and your family some questions. This will be during your visit to Alder Hey.

Your family will have to agree to take part, and they can say no.

Do I have to take part?

No. If you don't want to take part, that is fine. Talk to your family or doctor if you are not sure.

Can I change my mind?

Yes, this is not a problem. Just tell the nurse or doctor.

Who is doing this research?

Doctors at Alder Hey, and scientists at the University of Liverpool.

Who do I ask about this?

Your family will have been given lots of information. If you or they are not sure, the doctor or nurse who gave you this information leaflet can tell you more.

Thank-you for taking part in the PENDANT study

Figure 5.1 Participant Information Sheet (PIS) for very young participants (aged 3-6).

PENDANT study

A study to establish if there is a relationship between how unwell children and young people are when diagnosed with Type 1 Diabetes, and how well they manage later on

Information leaflet for parents/guardians

IRAS ID 264508
PENDANT Study – Parent Information Leaflet

The information we collect may help us to improve the service we deliver to our newly diagnosed patients and help to inform a future screening protocol.

How will we use information about your child?

We will need to use information from your child and their medical records for this research project.

This information will include your child's hospital number, name and contact details. People will use this information to do the research or to check your child's records to make sure that the research is being done properly.

People who do not need to know who you are will not be able to see your name or contact details. Your data will have a code number instead.

We will keep all information about you safe and secure.

Once we have finished the study, we will keep some of the data so we can check the results. We will write our reports in a way that no-one can work out that you took part in the study.

What are your choices about how your child's information is used?

- You can stop being part of the study at any time, without giving a reason, but we will keep information about you that we already have.
- We need to manage your records in specific ways for the research to be reliable. This means that we won't be able to let you see or change the data we hold about you.

What is this about?

We would like to invite you and your child to take part in our research study, to help understand the effects on families of a new diagnosis of Type 1 Diabetes. This leaflet will help you to understand why the research is being done, and what it will involve.

Our team will go through this information with you and answer any questions you may have.

What do we know about how well children and families manage a Type 1 Diabetes Diagnosis?

For both children and young people diagnosed with Type 1 diabetes, and their families, the time around diagnosis can seem confusing and frightening.

There are many different ways of coping, but we do not know a lot about how individual children and young people, or their families, manage. How much extra stress does this put on them? Do they need any extra help?

Why has your child been asked to take part in this study?

Your child has recently been diagnosed with Type 1 Diabetes and will be followed up by the team at Alder Hey.

What will the study involve?

The study involves completing a series of questionnaires (maximum of 40 minutes) with a member of our team. The questionnaires will focus on the level of stress you and your child have experienced since diagnosis, how you have coped with this stress, and how the diagnosis has impacted on quality of life. There are separate questionnaires to be completed by you and your child. This will normally be done within the hospital before/after your child's diabetes clinic appointments. However, if for any reason we are unable to collect this information during this time we may need to contact you by phone or arrange to do a home visit.

What will happen next?

If you agree to take part in this study, a member of our research team will ask you to sign a consent form. Once you have consented, we will arrange a time to see you before/after your child's diabetes clinic appointments to complete the series of questionnaires. If you are interested, we may ask you again in the future, but you can decide if you wish to take part in future.

Are there any risks/ benefits to taking part?

The questionnaires will take about 40 minutes extra, in addition to your child's diabetes clinic appointment. Medical care will be unaffected, but if we do find something that may affect your child's health, we will discuss this with you.

Some parents or children find talking about an illness distressing. If at any time you or your child feels that the actual or perceived distress is too great, please do not hesitate to tell the researcher. We have clinical psychologists within our team that you might find helpful.

Where can you find out more about how your child's information is used?

You can find out more about how we use your child's information:

- at www.hra.nhs.uk/information-about-patients/
- by asking one of the research team
- by sending an email to d.hawcutt@liv.ac.uk, who can put you in contact with the sponsor's Data Protection Officer.

Does my child have to take part?

No. If you are not happy then the doctors will keep looking after your child as normal. If you are not sure then we can arrange for someone to talk to you and help you make up your mind.

Can I change my mind?

Yes, this is not a problem. If you (or your child) change your mind, you can withdraw from the study at any time without giving reason (up to the point we publish the results).

Who is doing this research?

This research is being organised by the doctors at Alder Hey Children's Hospital and scientists at the Department of Women's and Children's Health at the University of Liverpool. Part of the study is being undertaken by a University of Liverpool medical student who has taken an extra year in their degree to do a Masters degree (an MPhil). The student is closely supported by the doctors and scientists.

As a student project, this research has no specific funding. The sponsor is Alder Hey Children's Hospital.

Has the study been checked?

Yes. All research that involves NHS patients (like your child) must be approved by a Research Ethics Committee before it goes ahead. The Committee is satisfied that your rights will be respected, that any risks have been reduced to a minimum and balanced against possible benefits, and that you have been given sufficient information on which to make an informed decision to take part or not.

Who do I ask about this?

The doctor or nurse who gave you this information leaflet can discuss the study with you more.

What if something goes wrong?

If you are unhappy, or have concerns about any aspect of this study, or would like to make a complaint, you should speak to the PALS office on 0151 252 5374, or via email PALS@alderhey.nhs.uk

Alternatively, you can contact Dr Dan Hawcutt (the researcher in charge of the study) at d.hawcutt@liv.ac.uk.

Figure 5.2 Participant Information Sheet (PIS) for parents.

5.3. Ethical Approval

Ethical approval for this study was granted by the West Midlands-South Birmingham Research Ethics Committee (REC) and the UK Health Research Authority (HRA) on the 25th October 2019 and 1st November 2019, respectively.

5.4. Ethical Amendments

Two ethical amendments were made to the initial study protocol. Amendment 1 was made on 13th December 2019 and amendment 2 on 11th March 2020. Full details of each amendment can be found in Appendix 14 and Appendix 15, respectively.

The original study protocol stated that participants would be consented and interviewed at their first clinic appointment, however, to be most in keeping with the study objectives, the appointment nearest to 3-months post-diagnosis was more appropriate. Thus, the first amendment was to reflect this change. A Notification of Non-Substantial/Minor Amendment(s) for NHS Studies was submitted to the HRA and was approved.

Most parents and children and young people had been willing to participate but were unable to take the extra time to complete the extensive number of questionnaires after/before their clinic appointment due to work or school commitments. Therefore, a second amendment was submitted with the aim of boosting recruitment rates. In version 2 of the study protocol, it was stated that parents and children who were willing to participate but were unable to due to time constraints could be contacted via telephone. However, early experience of issuing the large number of questionnaires in person suggested that completion would not be suitable over the phone. In order to try and recruit these patients, the option of a phone call was changed to the option of a home visit.

5.5. Aims

The majority of existing studies examine psychological factors in children who have been diagnosed for at least 6 months and often for over a year. Studies have shown that the adjustment period for children following a new diagnosis is 6-9 months (and 9-12 months for parents) (199), meaning that the time where psychological distress may be most prevalent is currently under-researched.

Therefore, the aim of this study was to assess the psychological impact of a new diagnosis of T1DM on children and young people.

5.6. Methods

The study has a prospective cohort design.

Newly diagnosed patients with T1DM have an outpatient hospital appointment within three months of diagnosis. Leading up to this appointment, there are also contacts with other members of the diabetes team, such as specialist nurses, to ensure that the disease is being appropriately managed.

Ideally, at one of these contacts, either as an outpatient or during the initial inpatient stay, the child/young person and their family will have the study discussed with them by one of the clinical members of the diabetes team. If they express interest, Participant Information Sheets (PISs) will be provided.

In some situations, if the young person and their family are willing, the study may be mentioned to them on the same day as the outpatient appointment where the questionnaires are being completed. Details on the questionnaires being issued can be found in section 5.7.

On the day of questionnaire completion, the young person and their family will give written informed consent/assent to a member of the study team. This includes permission to review historical health information on the hospital computer system. This will usually be at a clinic appointment within the first 3 months of diagnosis, but it may also be at a house visit previously arranged with the patient.

The questionnaires are estimated to take 30-45 minutes to complete.

After consent has been given and the questionnaires have been completed, a case record form for that participant is completed. The CRF was created by a postgraduate research Masters student (JC) in correspondence with a consultant paediatrician with extensive academic experience (DH), a consultant paediatric diabetologist (MD) and a paediatric clinical psychologist (LC) who works with children and young people with diabetes.

Families will have the opportunity to have follow-up questionnaires taken at subsequent clinic visits, but this is optional.

The normal pathway of care is maintained throughout the study.

The diabetes team will have had training on the study and so will know who to direct questions to in the event of queries from the family.

The completed questionnaires are reviewed by a trained clinical psychologist (LC) to identify any patients experiencing significant distress so that the appropriate support can be offered.

5.7. Psycho-social measures

Different questionnaires were issued to children/young people and parents depending on the age of their child to assess different psychological factors. Table 5.1 and Table 5.2 summarises the questionnaires that children and parents were expected to complete, respectively.

To assess trauma in the child, the Trauma Symptom Checklist for Children (TSCC) and the Trauma Symptom Checklist for Young Children (TSCYC) was used for participants aged 8-16 and 3-8 respectively. The TSCC is a 54 item self-report measure completed by the child, while the TSCYC contains 90 items and is completed by parents.

To assess trauma in the parent, the Paediatric Inventory for Parents (PIP) was used.

To assess diabetes distress, the Problem Areas in Diabetes (PAID) questionnaire is used. This questionnaire has a different version for children aged 8-12 (Problem Areas in Diabetes – Child; PAID-C) and young people aged 12-18 (Problem Areas in Diabetes – Teen; PAID-T). There is a corresponding parental version for parents of children in each age group (P-PAID-C and P-PAID-T, respectively).

To assess how the parent and child are coping with diabetes, the Response to Stress Questionnaire (RSQ) was used. This was a self-report measure for the child and was to be completed only by children aged 9 and over. For parents, there were two versions; one self-report regarding their own coping and one report on their perception of how the child is coping.

Quality of life was assessed only in the parent with the Wellbeing and Satisfaction of Caregivers of Children with Diabetes Questionnaire (WE-CARE).

Mental health was also assessed only in the parent. To assess depression, the Patient Health Questionnaire 9 (PHQ-9) was used and to assess anxiety the General Anxiety Disorder 7 (GAD-7) was used.

Factor Assessed	Age 3-8	Age 9-12	Age 12+
Trauma		TSCC	TSCC
Diabetes Distress		PAID-C	PAID-T
Coping		RSQ	RSQ

Table 5.1 Questionnaires to be completed by the child. Legend; TSCC: Trauma Symptoms Checklist for Children, PAID-C: Problem Areas in Diabetes – Child version, PAID-T: Problem Areas in Diabetes – Teen version, RSQ: Response to Stress Questionnaire.

Factor Assessed	Age 3-8	Age 9-12	Age 12+	Parent Measures
Child Trauma	TSCYC			
Diabetes Distress	P-PAID-C	P-PAID-C	P-PAID-T	
Child Coping	RSQ Type 1 Diabetes (parent report on child)	RSQ Type 1 Diabetes (parent report on child)	RSQ Type 1 Diabetes (parent report on child)	
Parental Coping				RSQ Type 1 Diabetes (Parent)
Parental Anxiety				GAD-7
Parental Depression				PHQ-9
Parental Trauma/Stress				PIP
Quality of Life				WE-CARE

Table 5.2 Questionnaires to be completed by the parent. Legend; TSCYC: Trauma Symptoms Checklist for Young Children, P-PAID-C: Problem Areas in Diabetes – Parent of Child version, P-PAID-T: Problem Areas in Diabetes – Parent of Teen version, RSQ: Response to Stress Questionnaire, GAD-7: General Anxiety Disorder 7, PHQ-9: Patient Health Questionnaire 9, PIP: Paediatric Inventory for Parents, WE-CARE: Wellbeing and Satisfaction of Caregivers of Children with Diabetes Questionnaire.

5.8. Recruitment

Contact was attempted with a view to recruitment into the study for 12 patients/their parents. 2/12 (16.7%) of the patients contacted agreed to participate in the study. 3/12 (25%) of the patients were not contactable by telephone after 3 attempts and answer phone messages. The remaining 7/12 (58.3%) of participants declined to participate. All of these patients cited a lack of time as their reason for not wishing to participate. They felt that the additional 30-45 minutes on top of the roughly an hour or more that they spend in the hospital for their clinic appointment was too much time due to work, school, and childcare commitments.

After the fourth patient had cited a lack of time on the day of the clinic visit as their reason for non-participation, an ethical amendment that would allow for home visits was submitted (see section 5.4 and Appendix 15).

The approval of this amendment coincided with the increasing number of COVID-19 cases in the UK and the resulting lockdown. As a result, for the safety of the participants and researchers, recruitment at this point was halted. The possibility of posting questionnaires to participants to complete at home was explored, but as this was not mentioned in the protocol submitted for ethical approval, this was not possible. It was also considered that this could reduce the quality of our data collection, as participants would not be able to immediately ask questions if they were unsure how to complete a section and may just complete a section incorrectly instead of spending more time attempting to get in touch with a member of the research team. Recruitment for this study will continue during the 2020-21 academic year, providing it is safe to do so.

5.9. Results

For the two recruited participants, patient A was a 14-year-old female and patient B was a 5-year-old male. Both participants had been diagnosed in the 3-months preceding their recruitment and for both participants, their mother was the person completing the parent measures. Table 5.3 contains the results of the measures for each participant and parent pairing.

Higher scores for each of the measures indicate increased severity in that domain. For the trauma measures (TSCC and TSCYC), the raw scores (which scale differently to each domain) have been converted into t-scores (which use the same scale) to aid interpretation.

Note that parents also completed the WE-CARE questionnaire to assess their quality of life and versions of the RSQ questionnaire to assess coping; these results have not been published here as for some questions, higher scores indicate a better quality of life and for others, higher scores indicate a worse quality of life. These questionnaires require more in-depth analysis that is not useful with such a small sample size.

Participant	Assessed Domain	Measure Used	Score
A	Child trauma	TSCC	Under-response: 47/111
			Hyper-response: 46/111
			Anxiety: 50/111
			Depression: 45/111
			Anger: 46/111
			Post-traumatic stress: 42/111
			Dissociation (general): 41/111
			Dissociation (overt): 40/111
			Dissociation (fantasy): 47/111
	Parent diabetes distress	P-PAID-T	57/90
	Child diabetes distress	PAID-T	35/84
	Parental anxiety	GAD-7	15/21
	Parental depression	PHQ-9	17/27
	Parental trauma/stress	PIP	Communication: frequency: 28/45
			Communication: difficulty: 27/45
			Medical care: frequency: 25/40
			Medical care: difficulty: 25/40
			Emotional distress: frequency: 54/75
			Emotional distress: difficulty: 64/75
			Role function: frequency: 27/50
			Role function: difficulty: 31/50
			Frequency total: 134/210
			Difficulty total: 147/210
B	Child trauma	TSCYC	Response level: 65/110
			Atypical response: 48/110
			Anxiety: 46/110
			Depression: 47/110
			Anger: 43/110
			Post-traumatic stress – intrusion: 47/110

			Post-traumatic stress – avoidance: 44/110
			Post-traumatic stress – arousal: 47/110
			Post-traumatic stress – total: 46/110
			Dissociation: 50/110
			Sexual concerns: 46/110
	Parent diabetes distress	P-PAID-C	57/90
	Child diabetes distress	PAID-C (completed by parent)	39/96
	Parental anxiety	GAD-7	3/21
	Parental depression	PHQ-9	2/27
	Parental trauma/stress	PIP	Communication: frequency: 16/45
			Communication: difficulty: 13/45
			Medical care: frequency: 18/40
			Medical care: difficulty: 13/40
			Emotional distress: frequency: 29/75
			Emotional distress: difficulty: 24/75
			Role function: frequency: 15/50
			Role function: difficulty: 16/50
			Frequency total: 78/210
			Difficulty total: 66/210

Table 5.3 Summary of questionnaire results completed by participants. Legend; TSCC: Trauma Symptoms Checklist for Children, TSCYC: Trauma Symptoms Checklist for Young Children, P-PAID-T: Problem Areas in Diabetes – Parent of Teen version, P-PAID-C: Problem Areas in Diabetes – Parent of Child version, PAID-C: Problem Areas in Diabetes child version, PAID-T: Problem Areas in Diabetes – teen version, GAD-7: General Anxiety Disorder 7, PHQ-9: Patient Health Questionnaire 9, PIP: Paediatric Inventory for Parents.

6. Discussion

6.1. Systematic Review

This study has identified many factors that are associated with adherence/non-adherence to insulin therapy. Studies were in strong agreement that age, depression, and smoking history were all negatively associated with adherence to insulin therapy and that glycaemic control, self-efficacy, family support, exercise frequency, increasing responsibility taken by the child/young person, socio-economic status and better parent-child relationship were all positively associated with adherence. Summaries of all assessed factors can be found in Table 3.15 and Table 3.16.

22/33 (66.66%) of the studies that assessed the association between age and treatment adherence found that adherence worsened with age. This is compared with just 2/33 (6.06%) that found adherence improves with age. The weighted mean age of participants in the studies suggesting that adherence worsens with age was 13.4 years, versus 11.4 years in the two studies suggesting that adherence improves with age. This supported the anecdotal hypothesis of the research team that the negative association between age and adherence begins during adolescence. There are several possible reasons for this association. When children are younger, more/the entirety of their care will be performed by their parents who are more likely to be able to maintain good adherence than just the child alone. As they become older, they will begin to take more responsibility for their care but will still likely be closely supervised by parents. As they enter adolescence, this supervision becomes more difficult and children will have times where they have the sole responsibility for their diabetes care, which they may not be accustomed to. Additionally, children and young people with diabetes still face all of the usual trials of adolescence, with increasing academic and personal life pressures potentially making adherence more difficult. The idea that it is the unique situation of adolescence that causes the decrease in adherence during this time is supported by the fact that adherence tends to improve again in the late teens/early twenties (167,178).

The strong negative association between depression and adherence could be of particular significance, as it is a modifiable factor with an established guideline for management (202). The reasons for the strong negative relationship between depression and adherence are likely linked to the symptoms of depression, which include a lack of motivation and even potentially a disregard for one's life (203).

The findings of the association between gender and adherence were somewhat surprising; the anecdotal hypothesis of the diabetes and research teams was that females generally have worse adherence than males in childhood, but this was only partially supported by the studies in this review, with 5/15 (33.33%) of studies finding that males had better adherence, 1/15 (6.67%) that females had better adherence and 9/15 (60%) having results that were non-significant. The weighted mean age of participants in the studies that suggested adherence was better in males was 14.9 years, versus 9.7 years in the study that suggested adherence was better in females. This difference in mean ages could indicate that it is not until adolescence that gender begins to play a part in adherence, but this cannot be assumed from such a small number of studies. Future studies could aim to clarify this relationship, perhaps via a longitudinal cohort study that assesses adherence, starting in pre-adolescence and continuing into adolescence. It is possible that the size of the effect of gender is reduced by the pre-adolescents in the samples, as during times of their life where most care is being performed by parents, it is less likely that their gender will make a difference.

The vast majority of studies that assessed glycaemic control found that better glycaemic control was associated with better treatment adherence. Despite its clear association, the inclusion of this factor in the study was a point of contention, due to the fact that improved glycaemic control is most likely a result of better adherence, not the other way around. The factor was ultimately included for several reasons. Firstly, it was felt that it was important to highlight the positive association between the two, to show that better adherence can indeed have dramatic physiological consequences. It was also included as while better adherence definitively results in improved glycaemic control, it could not be ruled out for glycaemic control to then have a knock-on effect upon further adherence. For example, if a patient had consistently good or improving HbA1c, this could motivate them to continue to have good adherence and vice versa. More research would need to be done that included questions on how HbA1c results affect the mindset of children and their parents, in order for this question to be definitively answered.

There are several limitations to this study. Firstly, as a result of the heterogeneity of the body of evidence, meta-analysis was not possible for any of the identified factors. Secondly, while all of the studies included in this review assess insulin adherence, they do not all express this aspect of adherence separately, with many studies presenting their results as a composite index. There were studies that were published in other languages, but we have overcome this by using fluent native speakers to extract these data, so no studies were excluded by reason of being written in a foreign

language. Any foreign language study that was screened and not included in the final data extraction was excluded due to not fitting the inclusion criteria.

Furthermore, one of the biggest issues facing studies that seek to identify factors associated with adherence is lack of an agreed and validated method of doing so. Many of the existing validated methods of measuring adherence to other medications are not appropriate when considering insulin use. For example, direct measurement of drug levels in the blood is invasive, unpopular with children and young people, technically difficult with the short half-life of insulin, as well as giving no indication of the patterns of adherence (204). Most general adherence questionnaires are predominantly designed to assess adherence to oral medications and as such do not factor in the additional difficulties a regular subcutaneous medication with such a potentially dangerous side effect (hypoglycaemia) may have. Medication Possession Ratio (MPR) is a validated measure used for all types of medication and has been used by some of the studies in this review, but even this assumes that all of the medication that the patient collects gets used and gets used in the correct way.

In the 76 studies contained within this review, there were 38 different methods used to assess adherence, with the most popular method being classed as “questionnaire not otherwise specified”, meaning that this figure itself is likely composed of multiple methods. Since the details of these questionnaires were not clear, this contributed to the difficulties in meta-analysis.

The next most common method of measuring adherence, being used by 7 studies, was the Self-Care Inventory (SCI). The SCI was first developed in 1988 (205) and was revised in 2005 (188). In 2009, a study (206) assessed the validity of the SCI for use as an adherence measure and found that it had both good internal consistency ($\alpha=0.8$) and good test-retest reliability ($r=0.77$, $p=<0.05$). In the 21 years from the development of the SCI in 1988, to its validation in 2009, no studies in this review used it as their measure of adherence. Since the validation of the tool in 2009, 7/30 (23.3%) of studies published in this time have used it as their measure of adherence, making it the joint most commonly used measure along with data from insulin pumps/BOLUS scores (both during this time period and overall). This suggests that the development of adherence measures without validation of those measures is largely not useful and that earlier validation of adherence measures could result in faster progression in this area of research.

Studies prior to 2009 were far more heterogenous in their method of adherence measuring, with the most common measure (aside from questionnaires and interviews that were not otherwise specified) being the Barrier to Adherence (BAQ) questionnaire, which was used by 4/46 (8.7%) of studies published in this time. This suggests that agreement on the best methods to use to assess adherence is slowly increasing with time.

Another issue when measuring adherence – particularly when relating to insulin adherence – is the number of components of taking insulin that are required to be correct in order to have good adherence. For example, in order to be fully adherent, a patient needs to take their insulin at the correct time, the correct amount of time before food, with the correct dose (often based on a calculation of the amount of carbohydrates in their food), into the correct site (rotating sites to avoid lipohypertrophy and malabsorption) and then perform the injection correctly. All of these steps are without even considering the changes made to insulin during hypoglycaemia management, which adds another layer of complexity. The systematic review has identified studies that have all measured these areas, but never all together.

To summarise the issues surrounding measuring adherence: self-report measures such as the SCI can result in reporting bias from the participants, objective measures such as MPR do not actually assess the use of the medication and observation of the patient administering their medication does not assess when the insulin is taken in their day-to-day life. Downloading of insulin pump data is perhaps the single method that solves most of these issues, however it does not account for all of the patients who receive treatment through MDI and so results in a sample that is not representative of the whole population. Each of these issues is solved by another method, but no studies have used these methods in combination with each other. Therefore, one of the recommendations for future research of this study is that multiple methods to measure adherence are used, but to ensure that each of these methods assesses a different component of adherence. For example, the SCI could be issued to measure the patient's general adherence in day-to-day life, MPR could be used to see if the patient's self-report is feasibly accurate, another questionnaire could be issued to assess the patient's competence in carbohydrate counting an insulin calculations, a third questionnaire or physical examination could assess the patient's rotation of the injection sites and lastly, the patient could be observed performing an injection to assess if they administer their injections correctly. This combination of methods would address the issues previously mentioned but has not been seen in any study to date.

While a large proportion of the factors identified in this study are only assessed by a single study, that does not diminish the usefulness of identification of the factors that have been assessed by greater number of studies. As seen in Table 3.16, there are clear groups of patients where additional resources could be directed to try and improve their adherence. For example, adherence has been shown to decrease with age in children; if interventions such as the "Sweet Talk" text messaging system (181), which was shown in an RCT to have a beneficial effect upon adherence, were targeted to this age group, it could mitigate the reduction in adherence. All seven studies assessing the effect of depression found that it had a statistically significant negative effect upon adherence, suggesting that investment in identification of these patients and psychological services to help them could be beneficial.

As well as trying to target the areas where adherence has shown to be worse, efforts could be directed to promote the factors that have shown to have a positive effect. For example, presence of family support was shown to have a statistically significant positive effect upon adherence, but none of the interventions proposed by the seven RCTs within this review were aimed at promoting supportive family environments.

The fact that only 7/76 (9.2%) of the studies included in this review are RCTs suggests that huge efforts are being devoted to identifying the factors that affect adherence to insulin therapy, but far less efforts are being directed towards addressing the issues that can be altered. Becoming a teenager is inevitable, as is longer duration of disease, but intervention studies should be developed for the modifiable factors, or around key times in the children and young people's lives, to assess the potential to improve adherence.

There was no specific funding associated with this review.

6.2. PENDANT Study

As a result of the COVID-19 pandemic halting recruitment to this study, it is clearly grossly underpowered and no real conclusions regarding the data can be drawn. Despite this, there were still many learning points, from both the first stages of the study itself and from the systematic review, that can be taken forward that will improve this study overall.

Firstly, there were no issues regarding completion of the measures from either the child participants or their parents, suggesting good usability.

The early difficulties with recruitment due to time constraints on the day of the patient's outpatient appointments have hopefully been addressed with the implementation of ethical amendments.

With the benefit of hindsight as a result of the systematic review, there are some improvements that can be made. In its current form, the study assesses eight different domains between the child and their parent, with multiple reports for some measures such as the RSQ, which has a child report upon themselves, a parent report on themselves and a parent report on the child. This creates a huge mass of data, with many of the measures asking similar questions, making parts of the data somewhat redundant. The large number of measures could be another contributing factor to the poor response rate during this initial phase.

While the measures all assess a clearly defined area, for some of these measures, it is not clear how they would be best compared with each other when analysing the data as a whole. For example, the WE-CARE questionnaire (which assesses the quality of life of the parent) has some questions where a higher score would indicate a better quality of life and some questions where a higher score would indicate a worse quality of life. It is therefore difficult to find a way to make valid correlations between this method and methods such as the TSCC/TSCYC (which assess trauma in the child) or the GAD-7 and PHQ-9 (which assess anxiety and depression in the parent, respectively), where higher scores always confer to greater severity in the assessed domain.

Therefore, a possible change to this study going forwards would be to choose measures where the scores are always comparable or where the direction of individual questions is represented by a sub-scale. For example, the Stark QoL questionnaire (207) is consistent in higher scores conferring to better quality of life. The disadvantage to this questionnaire when compared to the WE-CARE is that the WE-CARE is specifically designed for parents of children with diabetes, whereas the Stark QoL is not.

In considering other methods, such as a structured interview, it is likely that questionnaires are more practical as they do not require as much training for researchers to deliver and are less time-consuming as both parents and children can complete their measures simultaneously, which is an important consideration when time constraints have been cited as a common reason for non-participation.

An anecdotal observation based on the small sample size to date is that the large number of questionnaires could result in reduced accuracy, particularly in the child measures. Participant A appeared to be getting somewhat bored by the final questionnaire, with some questions seeming to be completed without actually reading them. Since participant B was too young to complete any questionnaires, this meant that all measures needed to be completed by their mother, meaning that they took much longer to complete. While the mother was completing these questionnaires, her child was clearly getting bored and was becoming restless, again resulting in the questionnaires being completed in a hurried fashion.
It is possible that with such a small sample, these are not problems that would be seen in a significant capacity going forward. However, this possibility, combined with the aforementioned similarity of some questions between questionnaires suggests that in the future, a more focused approach to a smaller number of domains may be desirable. The time constraints of the questionnaires would be in-part addressed by the possibility of home visits.

If assessment of adherence was desired and needed to be done through a single measure, the SCI would likely be the best option, with it being a validated measure of adherence that is used in the greatest number of studies, which would contribute to creating a more homogeneous body of research.

7. Conclusion

To the best of our knowledge, at the time of writing, this is the first study that has attempted to review factors that affect adherence to insulin therapy.

This study has identified many factors that are associated with adherence, with many being modifiable factors that could be potential areas for future interventions. It has also highlighted that while adherence to insulin requires adherence to many individual components, it is frequently assessed in ways that do not necessarily reflect this complex nature. By virtue of collecting together such a large number of studies and the methods that these studies use, this study has been able to make suggestions for future research that combines methods in order to get the most accurate reflection of adherence.

It has also provided an opportunity to improve ongoing primary research, so that it may make a better contribution to the future body of evidence.

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205. la Greca A, Swales T, Klemp S, Madigan S. Self care behaviors among adolescents with diabetes. Ninth Annual Sessions of the Society of Behavioral Medicine. 1988;A42.
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207. Hardt J. A new questionnaire for measuring quality of life - the Stark QoL. Health and Quality of Life Outcomes. 2015;

9. Appendix

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	50
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2-3
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	49
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	49
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	51
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	52
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	53
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	54, 374-376
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	54-55
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	55
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	51

Section/topic	#	Checklist item	Reported on page #
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	56-57
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	55
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	60
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	57-58
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	N/A
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	61-62
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	63-64
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	63, 235-238, 240, 242-243, 244-249
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	78-167, 172-173
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	70, 174-175

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	80, 93, 101, 108-109, 115, 122, 128, 131-132, 135-136, 139-140, 142-143
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	N/A
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	168-171, 190-192
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	192
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	194
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	192

Study Title	Lead Author	Year	Country	Setting (dropdown of inpatient, outpatient, intensive care, primary care, healthy participants)	Mean Age of Participants (include range or SD if given)	Mean duration of diabetes at start of study	Prospective, Retrospective, not known	Study Design (RCT, Cohort, Case Control, Case report)	Sample	Adherence to insulin therapy assessed (Y/N)	Primary, secondary outcome or not known	Over what time did they assess the patients' adherence (days/weeks/ months)	How did they measure adherence?	Factor assessed for association with adherence (please list all captured by study team). Please use a new row for each variable tested for association with adherence	Effect on adherence - how did each factor alter the use of insulin (numerical)	Statistical test	P value	Statistically significant (Y/N)
A randomized control trial of the effect of negotiated telephone support on glycaemic control in young people with Type 1 diabetes	Howells	2002	UK	Outpatient	16.8 (SD 3.4, range 12.3-24.8)	7.0y (SD 4.5, range 1.0-19.3)	Prospective	RCT	91	Y	Secondary	365 days	Self-efficacy for diabetes (SED) questionnaire, environmental barriers to adherence (BA) questionnaire	Group 2: Negiotiated Telephone Support	SED mean change: 4.81 (SD 10.74). BA mean change: 4.12 (SD 21.7)	ANOVA	NK	N
														Group 3: Negotiated Telephone Support, yearly clinical review, 3-monthly measurement of HbA1c	SED mean change: 7.32 (SD 9.1). BA mean change: -0.64 (SD 11.9)	ANOVA	NK	N
														Group 2 and 3 combined	SED mean change: 76 (t =	t-test	0.035	Y
A randomized controlled trial of Sweet Talk, a text-messaging system to support young people with diabetes	Franklin	2006	Scotland	Outpatient	NK	NK	Prospective	RCT	90	Y	Primary	365 days	Self-efficacy for diabetes (SED) questionnaire, environmental barriers to adherence (BA) questionnaire, self-reported	"Sweet talk" text message intervention (conventional insulin therapy)	SED increased by 6.1 when compared with group 1 (no intervention). Self-reported adherence score increased by 6.8.	ANCOVA	SED = 0.003. Self-reported adherence = 0.042	Y
Adherence among children and adolescents with insulin-dependent diabetes mellitus over a four-year longitudinal follow-up: I. The influence of patient coping and adjustment	Jacobson	1990	USA	Outpatient	NK	NK	Prospective	Cohort study	61	Y	Primary	1 460 days (4 years)	Self-created 4 point scale (1-4; poor-excellent). Validated by Jacobson et al., 1987.	Gender	NK	NK	NK	N
														Time between Dx and study entry	NK	NK	NK	N
														Age	Mean change = -0.11 (with increasing age).	F test	0.0002	Y
														Initial adjustment to diabetes	Mean change = +0.27 (with better adjustment)	F test	0.0001	Y
														Coping measures: ego defense level	Mean change = -0.05 (with higher ego defense score)	F test	0.02	Y
Adherence among children and adolescents with insulin-dependent diabetes mellitus over a four-year longitudinal follow-up: II. Immediate and long-term linkages with the family milieu	Hauser	1990	USA	Outpatient	12.8 (SD 1.9)	4.79 months (SD 3.97 months)	Prospective	Cohort study	52	Y	Primary	1 460 days (4 years)	Self-created 4 point scale Validated by Jacobson et al., 1987.	Patient perceptions of family conflict	-0.41	NK	<0.004	Y
														Parent perceptions of family	-0.2	NK	>0.05	N
														Patient perceptions of family cohesion	-0.37	NK	<0.01	Y
														Parent perceptions of family cohesion	0.32	NK	<0.05	Y
														Patient perceptions of expressiveness	0.17	NK	>0.05	N
														Parents perceptions of expressiveness	0.16	NK	>0.05	N
														Patient perception of family organisation	0.25	NK	>0.05	N
														Parent perception of family organisation	0.21	NK	>0.05	N
														Patient perception of control	-0.05	NK	>0.05	N
														Parent perception of control	-0.12	NK	>0.05	N
														Patient perception of independence	0.16	NK	>0.05	N
														Parent perception of independence	0.04	NK	>0.05	N

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Adherence to IDDM regimens: relationship to psychosocial variables and metabolic control.	Schafer	1983	USA	Outpatient	13; self-calculated (range 12-14)	4.61 years; self-calculated (range 1-11 years)	Prospective	Cohort study	34	Y	Primary	7 days	Barriers to adherence and problem solving questionnaire and summary of self-care activities questionnaire	Gender	"non-significant tendencies for boys to report taking more care when measuring insulin" (no numerical value	NK	<0.1	N
														Family Environment Scale (FES): Cohesion	0.11	NK	>0.05	N
														FES: Expressiveness	0.02	NK	>0.05	N
														FES: Conflict	0.1	NK	>0.05	N
														FES: Independence	-0.05	NK	>0.05	N
														FES: Organisation	-0.1	NK	>0.05	N
														Family Behaviour Checklist (FBC): Mother supportive	-0.14	NK	>0.05	N
														FBC: Mother negative	-0.14	NK	>0.05	N
														FBC: Father supportive	-0.07	NK	>0.05	N
														FBC: Father negative	-0.01	NK	>0.05	N
														Barriers to adherence	-0.29	NK	<0.1	N
Adherence to Insulin Pump Behaviors in Young Children with Type 1 Diabetes Mellitus	Patton	2017	USA	Outpatient	5.2 (SD 1.4. range 0.2	1.62 (SD 1.77)	Retrospective	Cohort study	116	Y	Primary	NK	Data retrospectively taken from patients' insulin pumps, looking at whether they corrected for high	Age	Number of days with 3 or more boluses given, r =	Means, SDs, frequency counts	0.01	Y
															Number of times parents corrected for glucose levels, r = +0.252	Means, SDs, frequency counts	0.05	Y
														Gender	Male: 57.4% of non-	Fisher's exact test	1	N
															Female: 42.6% of non-adherence	Fisher's exact test	1	N
														Age	Non-adherent: n = 54 (94.7%)	Mann-Whitney U-test	0.339	N
														Race	Malaysian: 35.2% of non-adherence	Fisher's exact test	1	N
															Chinese: 51.9% of non-adherence	Fisher's exact test	1	N
															Indian: 11.1% of non-	Fisher's exact test	1	N
															Other: 1.9% of non-	Fisher's exact test	1	N
														Co-morbidities?	Yes: 27.8% of non-adherence	Fisher's exact test	0.209	N
															No: 72.2% of non-adherence	Fisher's exact test	0.209	N
															Insulin aspart penfill + insulin glargine: 46.3% of non-adherence	Fisher's exact test	0.171	N
															Insulin aspart penfill + insulin detemir: 16.7% of non-adherence	Fisher's exact test	0.171	N
															Insulin lispro kwikpen + insulin glargine: 3.7% of non-adherence	Fisher's exact test	0.171	N
															Insulin aspart penfill only: 5.6% of non-adherence	Fisher's exact test	0.171	N
															Insulin aspart flexpen + insulin detemir: 1.9% of non-adherence	Fisher's exact test	0.171	N
															Insulin aspart flexpen + insulin glargine: 16.7% of non-adherence	Fisher's exact test	0.171	N
															Insulin aspart penfill + soluble insulin penfill + insulin glargine:1.9% of non-	Fisher's exact test	0.171	N
															Insulin aspart flexpen + soluble insulin penfill + insulin detemir: 1.9% of non-	Fisher's exact test	0.171	N
															30% soluble insulin/70%			

Study Title	Lead Author	Year	Country	Setting (dropdown of inpatient, outpatient, intensive care, primary care, healthy participants)	Mean Age of Participants (include range or SD if given)	Mean duration of diabetes at start of study	Prospective, Retrospective, not known	Study Design (RCT, Cohort, Case Control, Case report)	Sample	Adherence to insulin therapy assessed (Y/N)	Primary, secondary outcome or not known	Over what time did they assess the patients' adherence (days/weeks/ months)	How did they measure adherence?	Factor assessed for association with adherence (please list all captured by study team). Please use a new row for each variable tested for association with adherence	Effect on adherence - how did each factor alter the use of insulin (numerical)	Statistical test	P value	Statistically significant (Y/N)
Adherence to insulin treatment in children with type I diabetes mellitus at a hospital in Malaysia	Ying	2017	Malaysia	Outpatient	14.39 (SD 3.41)	8.05 (SD 3.83)	Retrospective	Cohort study	57	Y	Primary	365 days	MPR	Type of insulin	Soluble insulin + isophane insulin: 1.9% of non-	Fisher's exact test	0.171	N
															Insulin aspart flexpen + insulin glargine + isophane insulin: 1.9% of non-	Fisher's exact test	0.171	N
														Adjustment in insulin dose?	Yes: 70.4% of non-adherence	Fisher's exact test	1	N
															No: 29.6% of non-adherence	Fisher's exact test	1	N
														Age	Under 10, mean adherence score approx 725 (best)	Change in log-likelihood from each variable (degree of freedom for each	0.0001	Y
															10-15, mean adherence score approx 400	Change in log-likelihood from each variable (degree of freedom for each	0.0001	Y
															15-20, mean adherence score approx 350 (worst)	Change in log-likelihood from each variable (degree of freedom for each	0.0001	Y
															20+, mean adherence score approx 520	Change in log-likelihood from each variable (degree of freedom for each	0.0001	Y
														Intensity of insulin regimen (2 vs 4 injections per day)	No correlation	Change in log-likelihood from each variable (degree of freedom for each	NK	N
														Gender	No correlation	Change in log-likelihood from each variable (degree of freedom for each	NK	N
Adherence to insulin treatment, glycaemic control, and ketoacidosis in insulin-dependent diabetes mellitus	Morris	1997	Scotland	Outpatient	16 (SD 7)	7 (SD 4)	Retrospective	Cohort study	89	Y	Primary	365 days	MPR	Number of hospital admissions	No correlation	Change in log-likelihood from each variable (degree of freedom for each	NK	N

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Adherence-health status relationships in childhood diabetes	Johnson	1990	USA	Outpatient	NK (range 6-19)	NK (range 1-16.5)	Retrospective	Cohort study	78	Y	Primary	9 x separate 24 hour periods over 3	24 hour recall interviews to both the patient and their	Gender	F=4.61 (boys more compliant than girls)	ANOVA	<0.04	Y
														Age	-0.4	ANOVA	<0.007	Y
														Age	-0.06	Zero order	NK	N
														Duration of diabetes	-0.11	Zero order	NK	N
														Household income	0.04	Zero order	NK	N
														Better parent-child relationship	r=0.23, b=0.23	Zero order	<0.05	Y
														Increased disease severity	r=-0.22, b=-0.2	Zero order	<0.05	Y
														Increased treatment complexity	-0.17	Zero order correlations	NK	N
														Increased vulnerability to risks	r=-0.01, b=-0.14	Zero order correlations	NK	N
														Increased severity of risks	r=0.21, b=0.3	Zero order correlations	r=<0.05, b=<0.01	Y
														Self-efficacy	r=0.24, b=0.1	Zero order correlations	r=<0.05, b=>0	Y
														Response efficacy	r=0.3, b=0.18	Zero order correlations	<0.01, b=>0.05	Y
Adolescents' health attitudes and adherence to treatment for insulin-dependent diabetes mellitus	Palardy	1998	USA	Outpatient	14.07 (range 11-17, SI	4.79 (range 5 months-11.67 years, SD 3.04)	Retrospective	Cross-sectional	101	Y	Primary	NK	Summary of self-care activities questionnaire, completed by children and their parents	Response costs	r=-0.45, b=-0.36	Zero order correlations	r=<0.001, b=<0.001	Y
														Age	M report: 0.26, C report: 0.29	Zero order	<0.01	Y
														Gender	M report: -0.17 (better female adherence), C report: 0.02 (better male adherence)	Zero order correlations	NK	N
														Duration of diabetes	M report: 0.17, C report: 0.16	Zero order	NK	N
														Mother's increasing responsibility for management	M report: 0, C report: 0.17	Zero order correlations	NK	N
														Mother's increasing responsibility for management of daily regimen tasks	M report: -0.01, C report: 0.08	Zero order correlations	NK	N
														Mother's increasing responsibility for social presentation (talking to family and friends about disease etc.)	M report: -0.16, C report: -0.02	Zero order correlations	NK	N
														Child's increasing overall responsibility	M report: 0.14, C report: 0.2	Zero order correlations	M report: NK, C report: <0.05	M report: N, report: Y
Assessing family sharing of diabetes responsibilities.	Anderson	1990	USA	Inpatient	13.3 (range 6-21, SD 3	5.5 (range 1-15, SD 3	Retrospective	Cohort study	121	Y	Secondary	1 week	Diabetes Family Responsibility Questionnaire (DFRQ)	Increasing lack of responsibility from mother or child	M report: -0.23, C report: -0.06	Zero order correlations	M report: <0.05, C report: NK	M report: Y, report: N

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														ADHD	AG: 1.9%, EG: 3%, MG: 4.2%	Bonferroni correction	0.974	N
														Conduct disorder	AG: 1%, EG: 1.5%, MG: 2.8%	Bonferroni correction	0.358	N
														Oppostional defiant disorder	AG: 1.9%, EG: 0%, MG: 5.6%	Bonferroni correction	0.168	N
														Functional enuresis	AG: 3.9%, EG: 1.5%, MG: 2.8%	Bonferroni correction	0.625	N
														Depression (all subtypes)	AG: 4.9%, EG: 13.4%, MG: 18.3%	Bonferroni correction	<0.005	Y
														Dysthymia	AG: 0%, EG: 0%, MG: 4.2%	Bonferroni correction	0.019	Y
														Separation anxiety disorder	AG: 1%, EG: 3%, MG: 4.2%	Bonferroni correction	0.168	N
														Agoraphobia	AG: 1.9%, EG: 4.5%, MG: 2.8%	Bonferroni correction	0.671	N
														Specific (isolated) phobias	AG: 2.9%, EG: 9%, MG: 21.1%	Bonferroni correction	<0.001	Y
														Social phobia	AG: 0%, EG: 1.49%, MG: 7%	Bonferroni correction	0.004	Y
														OCD	AG: 0%, EG: 3%, MG: 1.4%	Bonferroni correction	0.333	N
														Clinical/subclinical eating	AG: 1.9%, EG: 6%, MG: 12.7%	Bonferroni correction	0.004	Y
														Generalised anxiety disorder	AG: 0%, EG: 0%, MG: 1.4%	Bonferroni correction	0.176	N
														PTSD	AG: 0%, EG: 4.5%, MG: 1.4%	Bonferroni correction	0.358	N
														Adjustment disorder	AG: 1%, EG: 0%, MG: 2.8%	Bonferroni correction	0.333	N
Association of insulin-manipulation and psychiatric disorders: A systematic epidemiological evaluation of adolescents with type 1 diabetes in Austria	Berger	2019	Austria	Outpatient	14.14 (SD 2.67)	NK	Retrospective	Cross-sectional	322	Y	Primary	NK	Interview	Adjustment disorder	AG: 1%, EG: 0%, MG: 2.8%	Bonferroni correction	0.333	N
														Alcohol/drug abuse	AG: 0%, EG: 0%, MG: 0%	Bonferroni correction	N/A	N/A
														Psychosis	AG: 0%, EG: 0%, MG: 0%	Bonferroni correction	N/A	N/A
														Any psychiatric disorder	AG: 17.5%, EG: 29.6%, MG: 46.5%	Bonferroni correction	<0.001	Y
Associations between major life events and adherence, glycemic control, and psychosocial characteristics in teens with type 1 diabetes.	Commissaria	2018	Denmark	Outpatient	14.9 (SD 1.3)	7.3 years (SD 3.7)	Prospective	Cross-sectional	178	Y	Primary	28 days	Diabetes Management Scale	0-1 adverse life events	Mean adherence score, C report: 75. P report: 74.	ANOVA and chi-squared	C: 0.002, P: 0.02	Y
														2-3 adverse life events	Mean adherence score, C report: 71. P report: 71.	ANOVA and chi-squared	C: 0.002, P: 0.02	Y
														4+ adverse life events	Adherence score, C report: 68. P report: 68.	ANOVA and chi-squared	C: 0.002, P: 0.02	Y
Benefits of an insulin dosage calculation device for adolescents with type 1 diabetes mellitus	Glaser	2004	USA	Outpatient	14.25 (self-calculate	5.1 years (self-calcu	Prospective	RCT	83	Y	Secondary	365 days	Diabetes Regimen Adherence Questionnaire (DRAQ)	Inconsistent Insulin Dosage Calculator Usage	Average adherence score change after 6 months: +0.12	chi-squared	0.27	N
														Consistent Insulin Dosage Calculator Usage	Average adherence score change after 6 months: +0.56	chi-squared	0.07	Y
														Control Group (manual calculations)	Average adherence score change after 6 months: +0.29	chi-squared	<0.001	Y
Benefits of using the I-port system on insulin-treated patients	Khan	2019	Saudi Arabia	Outpatient	14.96 (SD 8.95)	4.6 years (SD 4.25)	Prospective	Cohort study	55	Y	Primary	"equal to or greater than 3 months"	Interviews	Regular Use of I-Port	Non-compliance down to 11.1% at follow up, from 50% at baseline	chi-squared	0.028	Y
															Mean number of missed insulin doses in past three months down to 0.26 (SD 0.81) from 1.1 (SD 1.81)	chi-squared	0.032	Y
Brief report: Maternal posttraumatic stress symptoms are related to adherence to their child's diabetes treatment regimen.	Horsch	2014	England	Outpatient	NK	NK	Prospective	Cohort study	60	Y	Secondary	NK	The Adherence and IDDM Interview (Hanson et al., 1987)	PTSD diagnosis of mother overall	r = -0.115	Pearson correlation	0.19	N
														PTSD diagnosis of mother of children aged 0-8 at diagnosis	r = -0.519	Pearson correlation	0.008	Y
														PTSD diagnosis of mother of children aged 9-16 years at	r = 0.062	Pearson correlation	0.354	N
														PTSD diagnosis of mother vs no PTSD diagnosis: younger children	U = 4.500	Mann-Whitney U-test	0.009	Y
														PTSD diagnosis of mother vs no PTSD diagnosis: older children	U = 30.500	Mann-Whitney U-test	0.35	N

Study Title	Lead Author	Year	Country	Setting (dropdown of inpatient, outpatient, intensive care, primary care, healthy participants)	Mean Age of Participants (include range or SD if given)	Mean duration of diabetes at start of study	Prospective, Retrospective, not known	Study Design (RCT, Cohort, Case Control, Case report)	Sample	Adherence to insulin therapy assessed (Y/N)	Primary, secondary outcome or not known	Over what time did they assess the patients' adherence (days/weeks/ months)	How did they measure adherence?	Factor assessed for association with adherence (please list all captured by study team). Please use a new row for each variable tested for association with adherence	Effect on adherence - how did each factor alter the use of insulin (numerical)	Statistical test	P value	Statistically significant (Y/N)
Brief report: Parent's health literacy among high-risk adolescents with insulin dependent diabetes	Janisse	2010	USA	Outpatient	14.2 (SD 2.2)	4.5 years (SD 2.8)	Prospective	Cohort study	93	Y	Primary	NK	Diabetes Management Scale	Parents' health literacy (total sample)	r(91) = 0.2	NK	<0.1	N
														Parents' reading comprehension (intensive insulin regimen); P report on adherence	r(63) = 0.31	NK	<0.01	Y
														Parents' reading comprehension (intensive insulin regimen); C self-report on adherence	r(63) = 0.32	NK	<0.01	Y
Comparison of usability and patient preference for the new disposable insulin device solostar versus flexpen, lilly disposable pen, and a prototype pen: an open-label study	Haak	2007	Multiple : USA, Japan, France, Germany	Outpatient	NK (adults included too, but results separated out. Explicitly assessed paediatric age range: 11-15 years old).	NK	Prospective	Cross-sectional	510 overall, 116 11-15 year olds	Y	Secondary	NK	Watched users delivery an injection into a receptacle using each of the pens to assess usability	SoloStar pen vs all other pens	Percentage of participants completing all tasks successfully: 98%	chi-squared	<0.05	Y
														FlexPen vs Lilly and Pen X	Percentage of participants completing all tasks successfully: 97%	chi-squared	<0.05	Y
														Lilly Disposable Pen	Percentage of participants completing all tasks successfully: 72%	chi-squared	NK	N
														Pen X	Percentage of participants completing all tasks successfully: 79%	chi-squared	NK	N

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														Disease duration 1-3 years	Good compliance: 36%, satisfactory: 58%, poor: 6%	chi-squared	<0.001	Y
														Disease duration 3-6 years	Good: 17%, satisfactory: 79%, poor: 4%	chi-squared	<0.001	Y
														Disease duration more than 6 years	Good: 12%, satisfactory: 80%, poor: 4%	chi-squared	<0.001	Y
														Exercise frequency regular	Good: 90%, satisfactory: 10%, poor: 0%	chi-squared	<0.001	Y
														Exercise occassionally	Good: 68%, satisfactory: 29%, poor: 3%	chi-squared	<0.001	Y
														Exercises not at all	Good: 5%, satisfactory: 0%, poor: 95%	chi-squared	<0.001	Y
														Regularly smokes	Good: 0%, satisfactory: 84%, poor: 16%	chi-squared	<0.001	Y
														Occassionally smokes	Good: 2%, satisfactory: 91%, poor: 7%	chi-squared	<0.001	Y
														Doesn't smoke	Good: 64%, satisfactory: 35%, poor: 11%	chi-squared	<0.001	Y
														Regularly drinks alcohol	Good: 5%, satisfactory: 62%, pooor: 33%	chi-squared	<0.001	Y
														Occassionally drinks alcohol	Good: 9%, satisfactory: 78%, poor: 13%	chi-squared	<0.001	Y
														Doesn't drink alcohol	Good: 68%, satisfactory: 31%, poor: 1%	chi-squared	<0.001	Y
														Good motivation	Good: 39%, satisfactory: 61%, poor: 0%	chi-squared	<0.001	Y
														No motivation	Good: 2%, satisfactory: 83%, poor: 15%	chi-squared	<0.001	Y
														Strong sense of normailty	Good: 29%, satisfactory: 71%, poor: 0%	chi-squared	<0.001	Y
														Poor sense of normality	Good: 3%, satisfactory: 80%, poor: 17%	chi-squared	<0.001	Y
														Positive experience of results	Good: 26%, satisfactory: 72%, poor: 3%	chi-squared	<0.001	Y
														Negative experience of results	Good: 1%, satisfactory: 83%, poor: 16%	chi-squared	<0.001	Y
														Have energy and willpower	Good: 39%, satisfactory: 61%, poor: 8%	chi-squared	<0.001	Y
														No energy and willpower	Good: 3%, satisfactory: 86%, poor: 11%	chi-squared	<0.001	Y
														Has support from parents	Good: 33%, satisfactory: 67%, poor: 0%	chi-squared	<0.001	Y
														No support from parents	Good: 2%, satisfactory: 84%, poor: 14%	chi-squared	<0.001	Y
														Has support from physicians	Good: 39%, satisfactory: 61%, poor: 0%	chi-squared	<0.001	Y
														No support from physicians	Good: 7%, satisfactory: 87%, poor: 12%	chi-squared	<0.001	Y
														Has support from nurses	Good: 37%, satisfactory: 63%, poor: 0%	chi-squared	<0.001	Y

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Compliance of adolescents with diabetes	Kyngas	2000	Finland	Outpatient	15.1 (SD 1.51)	6.1 years (SD 3.8)	Prospective	Cross-sectional	289	Y	Primary	NK	Questionnaire	No support from nurses	Good: 1%, satisfactory: 85%, poor: 14%	chi-squared	<0.001	Y
														Positive attitude	Good: 31%, satisfactory: 69%, poor: 0%	chi-squared	<0.001	Y
														Negative attitude	Good: 0%, satisfactory: 85%, poor: 15%	chi-squared	<0.001	Y
														No threat to social well-being	Good: 36%, satisfactory: 64%, poor: 0%	chi-squared	<0.001	Y
														Threat to social well-being	Good: 3%, satisfactory: 82%, poor: 15%	chi-squared	<0.001	Y
														No threat to emotional well-being	Good: 29%, satisfactory: 66%, poor: 5%	chi-squared	<0.001	Y
														Threat to emotional well-being	Good: 7%, satisfactory: 85%, poor: 8%	chi-squared	<0.001	Y
														No threat to physical well-being	Good: 90%, satisfactory: 10%, poor: 0%	chi-squared	<0.001	Y
														Threat to physical well-being	Good: 2%, satisfactory: 143%, poor: 0%	chi-squared	<0.001	Y
Coping styles in youths with insulin-dependent diabetes mellitus	Hanson	1989	USA	Outpatient	NK	NK	Prospective	Cross-sectional	135	Y	Primary	NK	Self-report questionnaire based on Cerkoney and Hart, 1980	Utilising personal and interpersonal resources coping	-0.055	chi-squared	NK	N
														Ventilation and avoidance coping strategy	-0.367	chi-squared	<0.0001	Y
														Age	-0.21	chi-squared	0.008	Y
														Duration of diabetes	-0.16	chi-squared	0.032	Y
Crisis intervention program in newly diagnosed diabetic children.	Galatzer	1982	USA	Outpatient	15 (range 7-24)	NK	Prospective	Cross-sectional	223	Y	Secondary	NK	Interviews	Family relationship scores	0.64	Pearson correlation	NK	NK
														Sociability scores	0.46	Pearson correlation	NK	NK
														School/work performance	0.66	Pearson correlation	NK	NK
Depressive symptoms, daily stress, and adherence in late adolescents with type 1 diabetes.	Baucom	2015	USA	Outpatient	17.7 (SD 0.38)	7.46 years (SD 3.76)	Prospective	Cohort study	175	Y	Secondary	14 days	Questionnaire based on the diabetes Self-Care Inventory (La Greca, 2004)	Glycaemic control	improved glycaemic control (-0.31)	NK	<0.001	Y
														Depressive symptoms	-0.33	NK	<0.001	Y
														Mean general stress (GS)	-0.09	NK	NK	N
														Mean diabetes-specific stress (DSS) severity	-0.11	NK	NK	N
Development and validity testing of the revised diabetes self-care inventory for children and adolescents	Nakamura	2019	Japan	Outpatient	13.1 (SD 2.7)	6.8 years (SD 4.2)	Prospective	Cross-sectional	123	Y	Primary	NK	Revised Diabetes Self-Care Inventory (R-DSCI; Kanematsu, 1997). Note that this is not the same measure as the SCI made by La Greca.	Gender	Question F2: male: 11.2 (SD 2.7), female 10.7 (SD 2.2)	t-test	NK	N
														Insulin delivery method	Question F2: MDI: 10.9 (SD 2.4), CSII: 10.9 (SD 2.8)	t-test	NK	N
														Age	F2: 0.21	Pearson correlation	<0.05	Y
														Duration of diabetes	F2: -0.162	Pearson correlation	<0.05	Y
														HbA1c	F2: 0.266	Pearson correlation	<0.01	Y
Eating patterns in adolescents with type 1 diabetes: Associations with metabolic control, insulin omission, and eating disorder pathology.	Wisting	NK	Norway	Outpatient	15.7 (SD 1.8, range 12	5.6 years (SD 3.6)	Prospective	Cross-sectional	104	Y	Secondary	NK	Child Eating Disorder Examination v. 12.0 (ChEDE), in which insulin omission is assessed.	Frequency of breakfast	-0.369	chi-squared	<0.01	Y
														Frequency of mid-morning snack	-0.095	NK	NK	N
														Frequency of lunch	-0.127	NK	NK	N
														Frequency of mid-afternoon	-0.019	NK	NK	N
														Frequency of dinner	-0.28	chi-squared	<0.05	Y
														Frequency of evening snack	0.01	NK	NK	N
														Total meals	-0.332	chi-squared	<0.01	Y
Effects of a behavioral intervention on treatment adherence and stress management in adolescents with IDDM	Mendez	1997	Spain	Outpatient	13.36 (SD 1.89; control group), 13.83 (SD 2; experimental group)	4.46 (SD 3.52; control), 3.73 (SD 3.93; experimental)	Prospective	RCT	37	Y	Primary	13 months	Barriers to adherence questionnaire	Control group	Mean score of 13 at pre-test, post-test and follow up	NK	0	Y
														Intervention group	Mean score of 14 at pre-test, post-test and follow up	NK	0	Y

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Empirical validation for a family-centered model of care	Hanson	1995	USA	Outpatient	15.2 (range 12-20)	6.1 years (range 0.83	Prospective	Cross-sectional	157	Y	Primary	NK	Interviews	Age	-0.44	chi-squared	<0.0001	Y
														Duration of diabetes	-0.38	chi-squared	<0.0001	Y
														HbA1c	-0.3	chi-squared	<0.0001	Y
														Youth report on family cohesion	0.36	chi-squared	<0.0001	Y
														Maternal report on family	0.24	chi-squared	<0.0001	Y
														Youth report on family conflict	-0.3	chi-squared	<0.0001	Y
														Maternal report on conflict	-0.09	chi-squared	NK	N
														Youth report on family life stress	-0.09	chi-squared	NK	N
														Maternal report on family life	-0.24	chi-squared	<0.0001	Y
Engagement with a Text-Messaging Intervention Improves Adherence in Adolescents with Type 1 Diabetes: Brief Report.	Zhang	2018	NK	Outpatient	14.7 (SD 1.3, range 13	5.83 years (SD 3.4, range 1-14)	Prospective	Cohort study	48	Y	Secondary	8 weeks	Self-Care Inventory	Education group vs positive affect (PA) text message group	NK (insignificant)	NK	NK	N
														Low engagement with text	NK (insignificant)	NK	NK	N
														Good engagement with text message	NK (insignificant)	NK	NK	N
														High engagement with text	F = 8.75	NK	0.008	Y
Environmental factors affecting management of type 1 diabetes in children below the age of 10.	Piechowiak	2017	Poland	Outpatient	Group A: 6.8 (SD 2), group B: 7.5 (SD 1.7)	Group A: 3 years (SD 1.8 years), group B: 3.4 years (SD 2.2 years)	Prospective	Cross-sectional	165	N	N/A	N/A	N/A (but used General Self-Efficacy Scale questionnaire and Parental Diabetes Quality of Life Questionnaire to look for factors that could potentially affect it.	Lack of time	A: 26%, B: 18%	N/A	>0.05	N
														Poor material conditions	A: 20%, B: 28%	N/A	>0.05	N
														Fear of hypoglycaemia	A: 50%, B: 39%	N/A	>0.05	N
														Counting exchanges difficulties	A: 15%, B: 7%	N/A	>0.05	N
														Stress related pain	A: 36%, B: 39%	N/A	>0.05	N
														Frequent blood monitoring	A: 24%, B: 25%	N/A	>0.05	N
														Shame of diabetes	A: 6%, B: 3.5%	N/A	>0.05	N
														Snacking without parents	A: 17%, B: 43%	N/A	0.0008	Y
														Diabetes misunderstanding	A: 23%, B: 36%	N/A	>0.05	N
														Frequent infections	A: 24%, B: 23%	N/A	>0.05	N
														Estimation of food difficulties	A: 23%, B: 28%	N/A	>0.05	N
														Eating many meals	A: 18%, B: 28%	N/A	>0.05	N
														Taking care of other children	A: 17%, B: 16%	N/A	>0.05	N
														Parents' tiredness	A: 50%, B: 55%	N/A	>0.05	N
														Problems with care at kindergarten/school	A: 32%, B: 37%	N/A	>0.05	N
Executive functioning, parenting stress, and family factors as predictors of diabetes management in pediatric patients with type 1 diabetes using intensive regimens	Smith	2014	USA	Outpatient	13.6 (SD 3.1)	4.8 years (SD 3.2 yea	Prospective	Cross-sectional	NK	Y	Primary	NK	Diabetes Self-Management Profile (Harris et al., 2000)	Single parent household vs both parents	-2.38 (worse adherence in single-parent households; child report)	t-test	0.03	Y
														Duration of diabetes	-0.42 (parent report)	pearson	<0.001	Y
														Child's executive functioning	-0.274 (child report)	beta	0.007	Y
															-0.191 (parent report)	beta	0.07	N
															-2.96 (parent report; PIP-F)	t-test	0.004	Y
														Parenting stress	-0.333 (parent report; PIP-D)	beta	0.002	Y
Father-absent adolescents with insulin-dependent diabetes mellitus: A population at risk?	Hanson	1988	USA	Outpatient	14.4	5.4 years	Prospective	Cross-sectional	60	Y	Primary	NK	Interviews	Father-absent vs father-present	5.75 (better adherence in father-absent adolescents)	ANOVA	0.02	Y
Health-risk behaviors and type 1 diabetes outcomes in the transition from late adolescence to early emerging adulthood	Lee Tracy	2019	USA	Outpatient	NK (range 17-18)	7.35 years (SD 3.88 y	Prospective	Cohort study	197	Y	Primary	2 years	Questionnaire (single question about frequency of insulin witholding, 1-5 Likert-type scale and Diabetes Bahaviour Rating Scale)	Smoking frequency	-0.08	Multilevel modelling	0.004	Y
														Alcohol consumption frequency	NK (insignificant)	Multilevel modelling	NK	N
														Insulin witholding frequency	-0.03	Multilevel modelling	<0.001 within persons, 0.002 between	Y

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Hope and mealtime insulin boluses are associated with depressive symptoms and glycemic control in youth with type 1 diabetes mellitus	Calkins-Smit	2018	USA	Outpatient	13.68 (SD 1.76, range	6.01 (SD 3.11)	Prospective	Cross-sectional	90	Y	Primary	NK	BOLUS scores	Age	-0.27	Pearson correlation	<0.01	Y
														Perceived level of hope	0.26	Pearson correlation	<0.01	Y
														Depression	-0.33	Pearson correlation	<0.001	Y
														HbA1c	-0.4	Pearson correlation	<0.001	Y
I get by with a little help from my family and friends: Adolescents' support for diabetes care	La Greca	1995	USA	Outpatient	14.2 (SD 2.3, range 11	5.2 years (SD 3.5 years, range 0.5-14 years)	Prospective	Cross-sectional	74	Y	Secondary	NK	Interview (developed by Hanson et al., 1992)	Support from family	0.37	chi-squared	<0.01	Y
														Support from friends	0.05	chi-squared	>0.05	N
														Age	-0.24	chi-squared	<0.05	Y
														Gender	NK (insignificant)	chi-squared	>0.05	N
														Duration of diabetes	NK (insignificant)	chi-squared	>0.05	N
Illness perceptions and self efficacy beliefs in adolescents and young adults with insulin dependent diabetes mellitus	Griva	2000	UK	Outpatient	20.6 (SD 3.29; total sample, comprised of 26 adolescents, mean age 17.19, SD 1.12)	7.91 years (SD 4.67 years; total sample), 7.62 years (SD 4.36 years; adolescents)	Prospective	Cross-sectional	64	Y	Primary	NK	Self-report questionnaire based on the Reported Adherence to Medication Scale, Horne et al., 1999)	Identity	-0.24	Pearson correlation	NK	N
														Timeline	0.18	Pearson correlation	NK	N
														Consequences	-0.12	Pearson correlation	NK	N
														Cure-control	0.41	Pearson correlation	<0.001	Y
														Diabetes self-efficacy	-0.25	Pearson correlation	NK	N
														General self-efficacy	0.21	Pearson correlation	NK	N
														HbA1c	-0.26	pearson correlation	<0.01	Y

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Illness representations predict adherence in adolescents and young adults with type 1 diabetes	McGrady	2014	USA	Outpatient	17.45 (range 15-20, SI	8.16 years (SD 3.86)	Prospective	Cohort study	105	Y	Primary	3 months (two cross-sectional surveys)	Self-Care Inventory	Treatment effectiveness: control	T1: 0.12, T2: 0.15	Multivariate hierarchical regression	Both >0.05	N
														Treatment effectiveness: prevent	T1: 0.08, T2: 0.24	Multivariate hierarchical regression	T1: >0.05, T2: <0.05	T1 : N, T2: Y
														Perceived impact	T1: 0.01, T2: -0.03	Multivariate hierarchical	Both >0.05	N
														Perceived threat	T1: -0.22, T2: -0.16	Multivariate hierarchical	T1: <0.05, T2: >0.05	T1: Y, T2: N
														BGM frequency T1	T1: 0.26, T2: 0.25	Multivariate hierarchical	Both <0.05	Y
														BGM frequency T2	T1: 0.21, T2: 0.27	Multivariate hierarchical	Both <0.05	Y
														SCI: BGM T1	T1: 0.49, T2: 0.35	Multivariate hierarchical	Both <0.01	Y
														SCI: BGM T2	T1: 0.3, T2: 0.55	Multivariate hierarchical	Both <0.01	Y
														SCI: exercise T1	T1: 0.33, T2: 0.11	Multivariate hierarchical	T1: <0.01, T2: >0.05	T1: Y, T2: N
														SCI: exercise T2	T1: -0.04, T2: 0.17	Multivariate hierarchical	Both >0.05	N
														SCI: emergency precautions T1	T1: 0.23, T2: 0.12	Multivariate hierarchical	T1: <0.05, T2: >0.05	T1: Y, T2: N
														SCI: emergency precautions T2	T1: 0.26, T2: 0.33	Multivariate hierarchical	T1: <0.05, T2: <0.01	Y
														HbA1c T1	T1: -0.28, T2: -0.32	Multivariate hierarchical	Both <0.01	Y
														HbA1c T2	T1: -0.16, T2: -0.48	Multivariate hierarchical	T1: >0.05, T2: <0.01	T1: N, T2: Y
Impact of family environment and support on adherence, metabolic control, and quality of life in adolescents with diabetes.	Pereira	2008	Portugal	Outpatient	15 (range 10-18, SD 2	6.4 years	Prospective	Cross-sectional	157	Y	Primary	Cross-sectional	Self-Report Questionnaire on Adherence (Almeida & Pereira, 2003)	Age	0.221	Pearson	<0.01	Y
														Duration of diabetes	0.308	Pearson	<0.001	Y
														Social class	3.46 (higher social class better adherence). B=0.178 (lower class)	de Fisher	de fisher=<0.05 , b=<0.05	Y
														Gender	2.52 (males better adherence)	t-test	<0.05	Y
														FES: cohesion	-0.014	Pearson	>0.05	N
														FES: conflict	0.053	Pearson	>0.05	N
														FES: Organisation	0.053	Pearson	>0.05	N
														Family Social Support (FSS)	0.245	Pearson	<0.01	Y
														FSS: affective	0.234	Pearson	<0.01	Y
														FSS: indirect	0.144	Pearson	>0.05	N
														FSS: control	0.148	Pearson	>0.05	N
														FSS: no support	-0.095	Pearson	>0.05	N

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Insulin bolusing software: The potential to optimize health outcomes in type 1 diabetes mellitus	Driscoll	2013	USA	Outpatient	13.11 (range 7-19, SD	6.16 years (range 1.37-12.4 years, SD 3.21 years)	Prospective	Cross-sectional	31	Y	Primary	Previous 10-319 days (mean 102.52)	Downloaded data from insulin pump (hence hugely variable assessment range)	HbA1c	Bolus: -0.37, carbs: -0.34	pearson	Bolus: <0.05, carbs: <0.058	Bolus: Y, carbs: N (marginal)
														Age	Bolus: -0.46, carbs: -0.46	pearson	Bolus: <0.01, carbs: <0.05	Both Y
														Maternal Depression at T1	P report T1: -0.06. C report T1: -0.04. P report T2: -0.09. C report T2: -0.15.	Multiple regression analysis	All >0.05	All N
														Maternal Depression at T2	P report T1: -0.04. C report T1: 0.01. P report T2: -0.29. C report T2: -0.12.	Multiple regression analysis	P report T2: <0.01. Rest >0.05.	P report T2: Rest N.
														Maternal Involvement at T1: Mother's report	P report T1: 0.03. C report T1: 0.01. P report T2: 0.17. C report T2: -0.06.	Multiple regression analysis	All >0.05	All N
														Maternal Involvement at T1: child's report	P report T1: 0.09. C report T1: 0.05. P report T2: 0.18. C report T2: 0.04.	Multiple regression analysis	All >0.05	All N
														Maternal Involvement at T2: Mother's report	P report T1: 0.14. C report T1: 0.12. P report T2: 0.14. C report T2: 0.07.	Multiple regression analysis	All >0.05	All N
														Maternal Involvement at T2: child's report	P report T1: 0.27. C report T1: 0.19. P report T2: 0.27. C report T2: 0.11.	Multiple regression analysis	C report T2: >0.05. Rest <0.1	All N; P rep T1/T2 and C report T1 marginal.
Longitudinal associations of maternal depressive symptoms, maternal involvement, and diabetes management across adolescence.	Wiebe	2011	USA	Outpatient	12.79 (SD 1.7, range 10-15.99)	5.4 years	Prospective	Cohort study	82	Y	Primary	Previous 2 weeks (T2 16 months after T1)	Self Care Inventory (La Greca, 1994, 2004)	Age	P report T1: -0.28. C report T1: -0.17. P report T2: -0.23. C report T2: -0.05.	Multiple regression analysis	P report T1: <0.01. P report T2: <0.05. Both C report >0.05	P reports: Y. reports: N.

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														HbA1c	-0.3	Pearson	<0.01	Y
														Chronic stress	r=-0.11, b=-0.033	Multiple regression analysis & pearson	>0.05	N
														Social competence	r=0.25, b=-0.067	Multiple regression analysis & pearson	r=<0.01, b=>0.05	r=Y, b=N
														Family relations	r=0.32, b=0.194	Multiple regression analysis & pearson	r=<0.001, b=>0.05	r=Y, b=N
														Diabetes knowledge	r=0.28, b=0.227	Multiple regression analysis & pearson	r=<0.01, b=>0.05	r=Y, b=N
Model of associations between psychosocial variables and health-outcome measures of adolescents with IDDM	Hanson	1987	USA	Outpatient	14.4 (SD 2.45)	NK	Prospective	Cross-sectional	93	Y	Primary	Cross-sectional	Self-report and observation (Cerkoney and Hart and Schlenk and Hart)	Age	r=-0.21, b=-0.182	MRA and Pearson	r=<0.05, b=>0.05	r=Y, b=N
														Child's responsibility	0.32	NK	0.038	Y
														Glycaemic control	0.28	NK	0.056	N (margina
														Personality traits: stubborn, lazy, careless	38.20%	N/A	N/A	N/A
														Physical reasons: feels bad, disease is responsible	17.60%	N/A	N/A	N/A
														Denial: wants to be like others, doesn't admit to being diabetic	26.50%	N/A	N/A	N/A
														Hedonism: Hungry or not hungry, concerned about weight, too much bother	35.30%	N/A	N/A	N/A
Parent and child perceptions of the management of juvenile diabetes	Allen	1983	USA	Outpatient	11.2 (SD 2.6, range 8-	NK	Prospective	Cross-sectional	34	Y	Primary	Cross-sectional	Rated by two members of clinic staff (5-point Likert-like scale)	Interpersonal reasons: peer pressure, rebelling against	17.60%	N/A	N/A	N/A

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														Age	P report: -0.3, C report: -0.28, N (nurse) report: -0.33	Zero order correlations	All <0.01	Y
														Pubertal status	C report: worse adherence in mid-puberty vs pre/post; F(1, 82) = 6.4	Zero order correlations	<0.05	Y
															Mother's report: worse adherence with advanced pubertal maturation; F(1, 37) = 4.9	Zero order correlations	<0.05	Y
															Girl's report: worse adherence in mid-puberty;	Zero order correlations	<0.05	Y
														Socio-economic status	Lower SES related to poorer adherence; no numerical figure given	NK	NK	NK
														HbA1c	-0.22	Zero order	>0.05	N
														Parent report of general	0.29	Zero order	>0.05	N
														Child report of general	0.25	Zero order	>0.05	N
														Nurse report of general	0.18	Zero order	>0.05	N
														Self-report on adherence to BGM	0.24	Zero order	>0.05	N
														Self-report on adherence to	-0.27	Zero order	>0.05	N
														Self-report on adherence to	0.11	Zero order	>0.05	N
														Parent rating: discipline	Public hospital sample: r= P: 0.21, C: 0.08, N: 0.01. b=P: 0.08, C: -0.17, N: -0.22.	Zero order correlations	>0.05	N
															Private hospital sample: r=P: 0.05, C: 0.15, N: -0.12. b=P: -0.02, C:0.12, N: -0.07.	Zero order correlations	>0.05	N
														Parent rating: behavioural support	Public: r=P: 0.32, C: 0.4, N: 0.35. b=P: 0.17, C:0.22, N: 0.23	Zero order correlations	r=P and N: <0.05, C: <0.01. b=>0.05.	All Y
															Private: r=P: 0.05, C: 0.15, N: -0.12. b=P: 0.12, C: 0.03, N: -0.03.	Zero order correlations	>0.05	N
														Parent rating: warmth	Public: r=P: 0.55, C: 0.48, N: 0.35. b=P: 0.35, C:0.36, N: 0.29.	Zero order correlations	r=P: <0.05, C: <0.001, N: <0.01. b=C:<0.05, P and N: >0.05	All Y
															Private: r=P: 0.2, C: 0.13, N: -0.17. b=P: 0.11, C: 0.08, N: -0.14.	Zero order correlations	>0.05	N
														Parent rating: conflict	Public: r=P: -0.59, C: -0.25, N: -0.3. b=P: -0.54, C: -0.22, N: -0.3.	Zero order correlations	P: =<0.001, C: >0.05, N: <0.05	P and N: Y, C N
															Private: r=P: -0.32, C: -0.02, N: -0.09. b=P: 0.34, C: -0.01, N: -0.09.	Zero order correlations	P: <0.05, C and N: >0.05	P: Y, C and N N
														Child rating: discipline	Public: P: 0.23, C: 0.22, N: 0.23. b=P: 0.09, C: 0.14, N: 0.22	Zero order correlations	>0.05	N
															Private: r=P: 0.03, C: 0.1, N: 0.08. b=P: 0.03, C: 0.13, N: 0.08.	Zero order correlations	>0.05	N
														Child rating: behavioural support	Public: r=P: 0.46, C: 0.18, N: 0.32. b=P: 0.55, C: 0.23, N: 0.25	Zero order correlations	P: r and b=<0.001, C: r and b=>0.05, N: r= <0.05, b=>0.05	P and N: Y, C N
															Private: r=P: 0.16, C: 0.14, N: 0.15. b=P: 0.27, C: 0.09, N: 0.2.	Zero order correlations	>0.05	N
														Child rating: Warmth	Public: r=P: 0.4, C: 0.35, N: 0.37. b=P: 0.02, C: 0.11, N: 0.22.	Zero order correlations	r=P: <0.01, C and N: <0.05. b=all	All Y
													Asked participants to		Private: r=P: 0.03, C: 0.19, N: 0.03. b=P: -0.16, C: 0.05, N: -0.13	Zero order correlations	>0.05	N

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Parent-child relationships and the management of insulin-dependent diabetes mellitus	Miller-Johnson	1994	USA	Outpatient	Public hospital group: 13 (SD 2.6, range 8-18). Private hospital: 13 (SD 2.9, range 8-18)	NK	Prospective	Cross-sectional	88	Y	Primary	7 days	fill out a list of care tasks and the time of day that they completed them; this was then scored against the expected times, as rated by a nurse	Child rating: conflict	Public: r=P: -0.37, C: -0.5, N: -0.19. b=P: -0.5, C: -0.52, N: -0.25 Private: P: -0.15, C: -0.25, N: -0.06. b=P: -0.22, C: -0.31, N: -0.13.	Zero order correlations Zero order correlations	P: r=<0.01, b=<0.001, C: r and b= <0.001, N: r and b=>0.05. >0.05	P and C: Y, N N
														Acceptance	Male: 0.29 Female: 0.34	Bootstrapped standard errors Bootstrapped standard errors	<0.01 <0.01	Y Y
														Independence and encouragement	Male: 0.27 Female: 0.28	Bootstrapped standard errors Bootstrapped standard errors	<0.01 <0.01	Y Y
														Communication	Male: 0.27 Female: 0.25	Bootstrapped standard errors Bootstrapped standard errors	<0.01 <0.01	Y Y
														Intrusive support	Male: 0.1 Female: 0.14	Bootstrapped standard errors Bootstrapped standard errors	>0.05 <0.05	N Y
														Frequency of help	Male: 0.04 Female: 0.12	Bootstrapped standard errors Bootstrapped standard errors	>0.05 <0.1	N N (marginal
														General monitoring	Male: 0.46 Female: 0.26	Bootstrapped standard errors Bootstrapped standard errors	<0.01 <0.01	Y Y
															Male: 0.38	Bootstrapped standard errors	<0.01	Y
Parental involvement and adolescents' diabetes management: the mediating role of self-efficacy and externalizing and internalizing behaviors.	Berg	2011	USA	Primary Care	12.49 (SD 1.53)	4.13 years (SD 3 year	Prospective	Cross-sectional	252	Y	Secondary	Preceding month	Self-Care Inventory (La Greca et al., 1995) and Self-Efficacy for Diabetes Self-Management Scale (SEDMS; Ianotti, 2009)	Externalising behaviour Internalising behaviour Self-efficacy HbA1c	-0.24 -0.11 0.4 -0.31	Bootstrapped standard errors Bootstrapped standard errors Bootstrapped standard errors Bootstrapped standard errors	<0.01 <0.1 <0.01 <0.01	Y N (margina Y Y
Pathways from emotional adjustment to glycemic control in youths with diabetes in Hong Kong	Stewart	2000	Hong Kong	Outpatient	15.08 (diabetic patients) 15.17 (controls), range 9-21	6.67 years (SD 4.04 years, range 1-17 years)	Prospective	Case-control	70	Y	Primary	NK	Questionnaire constructed based upon Littlefield et al., 1992	HbA1c Pubertal stage Duration of diabetes Self-efficacy Frequency of conflict Intensity of conflict Authoritarian family function Locus of control: powerful others Locus of control: chance Locus of control: internal Emotional adjustment Gender	-0.41 -0.2 0.08 0.64 0.07 0.01 0.17 0.18 -0.06 0.17 -0.28 -0.26	NK NK NK NK NK NK NK NK NK NK NK Multiple regression analysis	<0.001 >0.05 >0.05 <0.001 >0.05 >0.05 >0.05 >0.05 >0.05 >0.05 <0.05 >0.05	Y N N Y N N N N N N Y N

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														Neuroticism	-0.505	Domain level	<0.01	Y
														Extraversion	0.151	Domain level	>0.01	N
														Openness to experience	0.051	Domain level	>0.01	N
														Agreeableness	0.46	Domain level	>0.01	N
														Conscientiousness	0.488	Domain level	<0.01	Y
														N1: anxiety	-0.441	Facet level correlation	>0.01	N
														N2: anger	-0.542	Facet level correlation	<0.01	Y
														N3: depression	-0.498	Facet level correlation	<0.01	Y
														N4 self-consciousness	-0.133	Facet level correlation	>0.01	N
														N5: impulsiveness	-0.348	Facet level correlation	>0.01	N
														N6 vulnerability	-0.378	Facet level correlation	>0.01	N
														E1: friendliness	0.263	Facet level correlation	>0.01	N
														E2: gregariousness	0.072	Facet level correlation	>0.01	N
														E3: assertiveness	0.09	Facet level correlation	>0.01	N
														E4: activity level	0.33	Facet level correlation	>0.01	N
														E5: excitement seeking	-0.146	Facet level correlation	>0.01	N
														E6: cheerfulness	0.156	Facet level correlation	>0.01	N
														O1: imagination	-0.183	Facet level correlation	>0.01	N
														O2: artistic interests	0.009	Facet level correlation	>0.01	N
														O3: emotionality	0.128	Facet level correlation	>0.01	N
														O4: adventurousness	0.089	Facet level correlation	>0.01	N
														O5: intellect	0.005	Facet level correlation	>0.01	N
														O6: liberalism	0.21	Facet level correlation	>0.01	N
														A1: trust	0.382	Facet level correlation	>0.01	N
														A2: morality	0.603	Facet level correlation	<0.01	Y
														A3: altruism	0.225	Facet level correlation	>0.01	N
														A4: co-operation	0.324	Facet level correlation	>0.01	N
														A5: modesty	0.13	Facet level correlation	>0.01	N
														A6: sympathy	0.205	Facet level correlation	>0.01	N
														C1: self-efficacy	0.48	Facet level correlation	<0.01	Y
														C2: orderliness	-0.018	Facet level correlation	>0.01	N
														C3: dutifulness	0.419	Facet level correlation	>0.01	N
														C4: achievement striving	0.382	Facet level correlation	>0.01	N
														C5: self-discipline	0.482	Facet level correlation	<0.01	Y
Personality traits as predictors of adherence in adolescents with type I diabetes	Wheeler	2012	USA	Outpatient	NK (range 13-18)	NK	Prospective	Cohort study	28	Y	Primary	Previous 6 months	Questionnaire	C6: cautiousness	0.517	Facet level correlation	<0.01	Y
Poor adherence to integral daily tasks limits the efficacy of CSII in youth	O'Connell	2011	Australia	Outpatient	13.6 (SD 3.2)	6.1 years (SD 3.1)	Retrospective	Cross-sectional	100	Y	Primary	Previous 14 days	Downloaded data from insulin pump	Age	-0.22 bolus events per day with per year of age.	logistic regression	0.001	Y
														Feel that diabetes affects their mental wellbeing	7.68 times more likely to be adherent than those who didn't	chi-squared	0.0001	Y
														Feel that they have support from their physician	6.69 times more likely to be adherent than those who didn't	chi-squared	0.0008	Y
														Feel that they have support from nurses	6.28 times more likely to be adherent than those who	chi-squared	0.0006	Y
														Have good motivation	5.52 times more likely to be adherent than those who	chi-squared	0.0004	Y
														Have energy and willpower	3.69 times more likely to be adherent than those who	chi-squared	0.0007	Y
														Feel that diabetes affects their physical wellbeing	2.95 times more likely to be adherent than those who	chi-squared	0.0032	Y
														1-3 years disease duration vs 3 years + duration	No value given; shorter disease better adherence	NK	<0.0001	Y
														Regularly exercises	90% good adherence, 10% satisfactory	NK	<0.0001	Y
														Doesn't smoke	64% good adherence	NK	<0.0001	Y
Predictors of good adherence of adolescents with diabetes (insulin-dependent diabetes														Doesn't consume alcohol	68% good adherence	NK	<0.0001	Y
														HbA1c below 7%	56% good adherence	NK	<0.0001	Y

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mellitus)	Kyngas	2007	Finland	Outpatient	15.1 (SD 1.51)	6.1 years (SD 3.8)	Prospective	Cross-sectional	289	Y	Primary	NK	Questionnaire	HbA1c above 7%	9% good adherence	NK	<0.0001	Y
Prevalence of intentional under- and overdosing of insulin in children and adolescents with type 1 diabetes	Schober	2011	Austria	Outpatient	**Ages given as medians**. Group A (compliant): 14, group B (non-compliant): 15, group C (management problems): 14, all range 10=21)	Group A: 6.2 (SD 3.9), group B: 6.2 (SD 3.4), group C: 6.1 (SD 3.4)	Prospective	Cross-sectional	241	Y	Primary	NK	Diabetes Self-Management Profile (Harris et al., 2000; German version, translated by the authors)	Age	A: 14 B: 15 C: 14	chi-squared, t and U test	N/A <0.01 (A vs N/A	N/A Y N/A
														Age at disease onset	A: 8.3 B: 9.5 C: 8.6	chi-squared, t and U test	N/A <0.05 (A vs <0.05 (B vs	N/A Y Y
														Duration of diabetes	A: 6.2 B: 6.2 C: 6.1	chi-squared, t and U test	N/A N/A N/A	N/A N/A N/A
														Gender	A: 56% boys B: 22% boys C: 25% boys	chi-squared, t and U test	N/A <0.01 (A vs <0.05 (A vs	N/A Y Y
														BMI SDS	A: -0.19 B: +0.18 C: -0.06	Bonferroni correction	>0.05 >0.05 >0.05	N N N
														HbA1c	A: 7.8 B: 8.7 C: 7.8	Bonferroni correction	N/A <0.01 (A vs >0.05	N/A Y N
														CIT insulin regimen	A: 5% B: 1%	chi-squared, t and U test	0.1	N
														FIT insulin regimen	A: 64% B: 51%	chi-squared, t and U test	0.23	N
														CSII insulin regimen	A: 29% B: 15%	chi-squared, t and U test	<0.05	Y
														Unknown regimen	A: 5% B: 4%	chi-squared, t and U test	0.6	N
Psychologic predictors of compliance in children with recent onset of diabetes mellitus	Jacobson	1987	USA	Outpatient	12.8 (SD 2.1, range 9-	0-2.9 months: 41.9%, 3-5.9: 30.6%, 6-8.9 months: 9.8%, 9 months or greater: 17.7%	Prospective	Cohort study	57	Y	Primary	18 months	Health-provider ratings	0-9 months post-follow up 10-18 months post-follow up	mean compliance: 3.3 (SD mean compliance: 3 (SD 0.5)	ANOVA	<0.005	Y
														Compliance in the first 9 months' association with compliance in the second 9 months	0.53-0.64	Pearson	<0.001	Y
														Duration of diabetes	NK (insignificant)	Pearson	>0.05	N
														Age	F = 6.57 (increasing age associated with worse adherence)	ANOVA	<0.01	Y
														Self-esteem	0-9 mo: 0.27, 4.77 10-18 mo: 0.36, 12.5	ANOVA ANOVA	<0.04 <0.0008	Y Y
														Perceived competence	0-9 mo: 0.22, 1.12 10-18 mo: 0.3, 6.44	ANOVA ANOVA	>0.05 <0.04	N Y
														Locus of control	0-9 mo: 0.24, 2.56 10-18 mo: 0.34, 11.28	ANOVA ANOVA	>0.05 <0.0008	N Y
														Child report of symptoms	0-9 mo: 0.22, 1.07 10-18 mo: 0.32, 10.5	ANOVA ANOVA	>0.05 <0.005	N Y
														Mother report of symptoms	0-9 mo: 0.3, 8.86 10-18 mo: 0.33, 6.19	ANOVA ANOVA	<0.005 <0.04	Y Y
														Mother report of social functioning	0-9 mo: 0.45, 10.25 10-18 mo: 0.43, 9.37	ANOVA ANOVA	<0.005 <0.005	Y Y
														Diabetes adjustment	0-9 mo: 0.24, 2.75 10-18 mo: 0.42, 14.8	ANOVA ANOVA	>0.05 <0.0008	N Y
														Age	-0.31	Pearson, cronbach's, t	<0.001	Y
														Duration of diabetes	-0.17	Pearson, cronbach's, t	<0.001	Y
														Household income	0.18	Pearson, cronbach's, t	<0.001	Y
														Caregiver education level	0.05	Pearson, cronbach's, t	<0.18	N

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														Two-parent vs single parent household	0.08 (better adherence in two-parent households)	Pearson, cronbach's, t	>0.05	N
														Gender	0.07 (girls better adherence)	Pearson, cronbach's, t	>0.05	N
														CSII vs MDI	0.18 (CSII better adherence)	Pearson, cronbach's, t	>0.05	N
Psychometric evaluation of the adherence in diabetes questionnaire	Kristensen	2012	Denmark	Outpatient	12.3 (SD 3.69)	5.2 years (SD 3.31)	Prospective	Cohort study	1028	Y	Primary	Previous month	Adherence in Diabetes Questionnaire (ADQ)	HbA1c	-0.36 (C report), -0.32 (P report)	Pearson, cronbach's, t	<0.001	Y
														QoL (with number of injections per day)	chi-sqaured value: 6.73	Kruskal-Wallis test	<0.001	Y
Quality of life and glycemic control in adolescents with type 1 diabetes and the impact of an education intervention	Abolfotouh	2011	Egypt	Outpatient	14.63 (SD 2.23, range 12-20)	NK	Prospective	RCT	503	Y	Secondary	Previous month	Questionnaire	Intervention group vs control group (with general adherence)	Intervention pre-test: 89.66 Intervention post-test: 94.4 Control pre-test: 63.9 Control post-test: 51.23	Wilcoxon test	<0.001	Y
Quality of life of children and adolescents with type 1 diabetes in Kuwait.	Abdul-Rasoul	2013	Kuwait	Outpatient	Diabetic group: 9.1 (SD 3.7), control	5.37 (SD 2.8)	Prospective	Case-control	Diabetic	Y	Secondary	NK	Paediatric Quality of Life Inventory (PedsQL)	Gender	Girls' mean score: 76.6 (SD Boys' mean score: 69.7 (SD	t test	<0.05	Y
														Self-efficacy	0.57	NK	<0.001	Y
														Depression	-0.5	NK	<0.001	Y
Relationship of self-efficacy and binging to adherence to diabetes regimen among adolescents	Littlefield	1992	Canada	Outpatient	15.3 (range 13-18)	5.8 years (SD 3.9 yea	Prospective	Cross-sectional	193	Y	Primary	Cross-sectional	Questionnaire	Self-esteem	0.45	NK	<0.001	Y
														Binging (as in, on food)	-0.36	NK	<0.001	Y
														General insulin adherence: Immigrant vs French Native mother	Immigrant mother score: 3.9 (SD 1.1) French native mother score: 4.6 (SD 1.1)	ANOVA	<0.01	Y
Risk factors for poor glycemic control in diabetic children in France.	Tubiana-Rufi	1995	France	Outpatient	Median: 10 (range 7-	Median: 2 years (range 0.5-11 years)	Prospective	Cross-sectional	165	Y	Primary	Cross-sectional	Questionnaire (Hanson et al., 1992)	Percentage that adjust insulin dose during illness: Immigrant	Immigrant mothers: 29.2% Native French mother: 62%	ANOVA	<0.001	Y
Satisfaction and quality of life with premeal inhaled versus injected insulin in adolescents and adults with type 1 diabetes	Testa	2007	USA and Canada	Outpatient	control group: 14.1 (SD 1.7, range 11-17), inhaled insulin group: 13.8 (SD 1.4, range 12-17)	Control group: 6.1 years (SD 3.5 years, range 1-13.6 years). Inhaled insulin group: 5.5 years (SD 3.5 years, range 1-13.7 years)	Prospective	Cohort study	207	Y	Primary	24 weeks	Questionnaire	Method of insulin delivery barriers to adherence	Inhaled insulin score: 74.2 (SD 1.4) S/C insulin score: 67 (SD 1.6)	Pearson (r) and Spearman (rho)	0.001	Y

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Self-efficacy as a mediator variable for adolescents' adherence to treatment for insulin-dependent diabetes mellitus	Ott	2000	USA	Outpatient	13.97 (SD 1.76. range 11-18)	5.63 years (SD 3.73 years, range 1.08-15 years)	Prospective	Cross-sectional	161	Y	Primary	cross-sectional (previous 7 days)	Summary of self-care activities (Schafer et al. 1983)	Age	-0.04	Zero order	>0.05	N
														Illness severity	-0.16	Zero order	>0.05	N
														Duration of diabetes	-0.1	Zero order	>0.05	N
														Self-efficacy	0.21	Zero order	<0.01	Y
														Diabetes Family Responsibility Questionnaire	0.19	Zero order correlations	<0.05	Y
														Diabetes Family Behaviour: Supportive subscale	0.36	Zero order correlations	<0.005	Y
														Diabetes Family Behaviour: Nonsupportive subscale	-0.29	Zero order correlations	<0.005	Y
Sleep duration and its impact on adherence in adolescents with type 1 diabetes mellitus	McDonough	2017	USA	Outpatient	15 (SD 1.6, range 12.4	6.8 years (SD 3.9 years, range 0.8-15.2 years)	Prospective	Cross-sectional	45	Y	Primary	14 days	Total daily insulin boluses and mealtime BOLUS score	Amount of sleep	Every 1 minute increase/decrease in sleep resulted in 1.2% increase/decrease in the total number of daily boluses/20 minutes per	ANOVA	<0.001	Y
Social competence and parental support as mediators of the link between stress and metabolic control in adolescents with insulin-dependent diabetes mellitus	Hanson	1987	USA	Outpatient	14.5	NK	Prospective	Cross-sectional	104	Y	Primary	Cross-sectional	Self-report and observation (Cerkoney and Hart, 1980 and Schlenk and Hart, 1984)	HbA1c	-0.28	Pearson	<0.001	Y
														Stress	-0.08	Pearson	>0.05	N
														Social competence	0.2	Pearson	<0.05	Y
														Parental support	0.32	Pearson	<0.001	Y

Study Title	Lead Author	Year	Country	Setting (dropdown of inpatient, outpatient, intensive care, primary care, healthy participants)	Mean Age of Participants (include range or SD if given)	Mean duration of diabetes at start of study	Prospective, Retrospective, not known	Study Design (RCT, Cohort, Case Control, Case report)	Sample	Adherence to insulin therapy assessed (Y/N)	Primary, secondary outcome or not known	Over what time did they assess the patients' adherence (days/weeks/ months)	How did they measure adherence?	Factor assessed for association with adherence (please list all captured by study team). Please use a new row for each variable tested for association with adherence	Effect on adherence - how did each factor alter the use of insulin (numerical)	Statistical test	P value	Statistically significant (Y/N)
															CSII: 1.81 different sites used (SD 0.82)		NK	NK
														CSII vs MDI	MDI: 2.81 different sites used (SD 0.9)	t test	NK	NK
															MDI: 0.04		0.7	N
														Age	CSII: -0.01	Pearson	0.99	N
															MDI: -0.09		0.37	N
														Time since diagnosis	CSII: -0.07	Pearson	0.49	N
															MDI: NK		0.26	N
														Parental marital status	CSII: NK	t test	0.89	N
															MDI: NK		Fathers: 0.75	N
														Parental education level	CSII: NK	t test	Fathers: 0.06	N
														Perceived barriers to site rotation	MDI: -0.28		0.01	Y
															CSII: -0.21	Pearson	0.06	N
															MDI: 49%		NK	NK
Survey of insulin site rotation in youth with type 1 diabetes mellitus.	Patton	2010	USA	Outpatient	11.8 (SD 3.4, range 2-	5.9 years (SD 3.4 years, range 1-15.9 years)	Prospective	Cross-sectional	201	Y	Primary	Cross-sectional	Questionnaire	New sites would be painful	CSII: 64%	Chi-squared	NK	NK
															MDI: 54%		NK	NK
														Comfort with existing routine	CSII: 67%	Chi-squared	NK	NK
														Age	-0.34	pearson	<0.01	Y
														Perceived Support Scale for	0.11	pearson	>0.05	N
														Family Environment Scale (FES): Cohesion	0.32	pearson	<0.01	Y
The Diabetes Social Support Questionnaire-Family Version: Evaluating adolescents' diabetes-specific support from family members	La Greca	2002	USA	Outpatient	14.2 (SD 2.3, range 11	5.2 years (SD 3.5 yea	Prospective	Cross-sectional	74	Y	Primary	Cross-sectional	Interview (developed by Hanson et al., 1992)	Diabetes Social Support Questionnaire: frequency	0.2	pearson	>0.05	N
														Diabetes Social Support Questionnaire: individualised	0.27	pearson	<0.05	Y
The Effect of Family-centered Care on Management of Blood Glucose Levels in Adolescents with Diabetes.	Cheraghi	2015	Iran	Outpatient	11.8 (SD 1.44, range 1	NK	Prospective	Cross-sectional	40	Y	Primary	Cross-sectional	Management Behaviours of Adolescents (Harris et al., 2000 and La Greca, 1995)	Pre-intervention	score: 36.78 (SD 10.12)			
														Post-intervention	score: 37 (SD 10.26)	Pearson and t test	<0.0001	Y
The efficacy of intensive individual play therapy for chronically ill children	Jones	2002	USA	Outpatient	NK	NK	Prospective	RCT	30	Y	Secondary	3 months (two cross-sectional	Diabetes Adaptation Scale - Parent Form	Intervention group vs control group (with general adherence)	Post-test: 0.156		0.697	N
															3-month follow-up: 0	ANCOVA	0.997	N

Study Title	Lead Author	Year	Country	Setting (dropdown of inpatient, outpatient, intensive care, primary care, healthy participants)	Mean Age of Participants (include range or SD if given)	Mean duration of diabetes at start of study	Prospective, Retrospective, not known	Study Design (RCT, Cohort, Case Control, Case report)	Sample	Adherence to insulin therapy assessed (Y/N)	Primary, secondary outcome or not known	Over what time did they assess the patients' adherence (days/weeks/ months)	How did they measure adherence?	Factor assessed for association with adherence (please list all captured by study team). Please use a new row for each variable tested for association with adherence	Effect on adherence - how did each factor alter the use of insulin (numerical)	Statistical test	P value	Statistically significant (Y/N)
The health belief model and adolescents with insulin-dependent diabetes mellitus	Bond	1992	USA	Outpatient	14.2 (SD 2.3, range 10	5.8 years (SD 3.7 years, range 1-16 years)	Prospective	Cross-sectional	56	Y	Primary	Cross-sectional; previous 24 hours	Diabetes Regimen Compliance Questionnaire (DRCQ; Brownlee-Duffeck et al., 1987), Diabetes Self-Care Activities Summary (DSCQ; McCaul, Glasgow and Shafer, 1987) and 3x Child Compliance Telephone Interviews (CCTIs; Johnson et al., 1986)	Age	DSCQ: NK CCTI: -0.28	Hierarchical Hierarchical	>0.05 <0.05	N Y
														Benefits - costs	DRCQ: 0.17 DSCQ: 0.31 CCTI: -0.05	Standardised regression Standardised Standardised	>0.05 <0.05 >0.05	N Y N
														Threat	DRCQ: -0.08 DSCQ: -0.05 CCTI: 0.09	Standardised Standardised Standardised	>0.05 >0.05 >0.05	N N N
														Cues	DRCQ: 0.2 DSCQ: 0.34 CCTI: 0.36	Standardised regression Standardised Standardised	>0.05 <0.01 <0.01	N Y Y
														Benefits - costs and threat	DRCQ: -0.38 DSCQ: NK CCTI: NK	Standardised Standardised Standardised	<0.01 >0.05 >0.05	Y N N
The impact of mothers' sense of empowerment on the metabolic control of their children with juvenile diabetes	Florian	1998	Israel	Outpatient	15.11 (SD 1.7, range 1	6.6 years (SD 3.6 years, range 2-16 years)	Prospective	Cross-sectional	88	Y	Primary	Cross-sectional; previous month	Self-Care Questionnaire (Glasgow et al., 1987)	Mother's sense of empowerment Mother's age Mother's education Economic status Number of children in family Age Child's gender Diabetes duration HbA1c	0.2 -0.07 0.13 -0.14 0.03 -0.16 -0.24 (worse adherence in -0.19 -0.25	Pearson Pearson Pearson Pearson Pearson Pearson Pearson Pearson Pearson	<0.05 >0.05 >0.05 >0.05 >0.05 >0.05 <0.05 <0.05 <0.01	Y N N N N N Y Y Y
The Interactive Effect of Diabetes Family Conflict and Depression on Insulin Bolusing Behaviors for Youth	Maliszewski	2017	USA	Outpatient	13.64 (SD 1.77)	5.88 years (SD 3.15 years)	Prospective	Cross-sectional	91	Y	Primary	Cross-sectional; variable amount of time downloaded	BOLUS scores	HbA1c Age Mean daily blood glucose Youth depression Diabetes family conflict (parent report) Diabetes family conflict (child report)	-0.556 -0.286 -0.428 -0.28 -0.293 -0.166	Pearson Pearson Pearson Pearson Pearson Pearson	<0.01 <0.01 <0.01 <0.01 <0.01 >0.05	Y Y Y Y Y N
The relationship between negative communication and body image dissatisfaction in adolescent females with type 1 diabetes mellitus	Kichler	2008	USA	Outpatient	14.1 (SD 1.88, range 1	NK	Prospective	Cross-sectional	75	Y	Primary	Cross-sectional	Self-Care Inventory (SCI; Greco et al., 1990 and La Greca et al., 1988) and Diabetes Self-Management Profile (DSMP; Haris et al., 2000)	BMI SDS Negative communication Eating Disorders Inventory - Body Dissatisfaction Scale Eating Attitudes Test 26 HbA1c	-0.19 -0.39 -0.43 -0.45 -0.54	NK NK NK NK NK	>0.05 <0.01 <0.01 <0.01 <0.01	N Y Y Y Y
The role of health beliefs in the regimen adherence and metabolic control of adolescents and adults with diabetes mellitus	Brownlee-Duffeck	1987	USA	Outpatient	18 (SD 2.6, range 13-2	8.9 years	Prospective	Cross-sectional	54	Y	Primary	Cross-sectional	Diabetes Regimen Adherence Questionnaire (DRAQ)	Age Knowledge Health Belief Model (HBM): Sever HBM: Susceptibility HBM: costs HBM: Benefits HBM: cues to action	r= -0.02, b= -0.58 r=0.0, b=0.02 r=0, b=0.07 r=0.01, b=-0.29 r=0.25, b=-1.19 r=0.02, b=0.32 r=0, b=-0.43	sr squared sr squared sr squared sr squared sr squared sr squared sr squared	>0.05 >0.05 >0.05 >0.05 <0.0001 >0.05 >0.05	N N N Y N N N

Study Title	Lead Author	Year	Country	Setting (dropdown of inpatient, outpatient, intensive care, primary care, healthy participants)	Mean Age of Participants (include range or SD if given)	Mean duration of diabetes at start of study	Prospective, Retrospective, not known	Study Design (RCT, Cohort, Case Control, Case report)	Sample	Adherence to insulin therapy assessed (Y/N)	Primary, secondary outcome or not known	Over what time did they assess the patients' adherence (days/weeks/ months)	How did they measure adherence?	Factor assessed for association with adherence (please list all captured by study team). Please use a new row for each variable tested for association with adherence	Effect on adherence - how did each factor alter the use of insulin (numerical)	Statistical test	P value	Statistically significant (Y/N)
Type 1 diabetes among adolescents: Reduced diabetes self-care caused by social fear and fear of hypoglycemia	Di Battista	2009	USA and Canada	Outpatient	15.9 (SD 1.44, range 1	6.42 years (SD3.63 years)	Prospective	Cross-sectional	76	Y	Primary	Cross-sectional	Summary of Diabetes Self-Care Activities Questionnaire (SDSCA)	Social anxiety	Boys: -0.39 Girls: 0.21	Pearson	<0.05 >0.05	Y N
														QoL: Satisfaction	Boys: -0.42 Girls: -0.12	Multiple regression analysis	<0.05 >0.05	Y N
														QoL: Impact	Boys: -0.38 Girls: -0.11	Multiple regression analysis	<0.05 >0.05	Y N
														QoL: Social worry	Boys: -0.3 Girls: 0	Multiple regression analysis	>0.05 >0.05	N N
														QoL: Diabetes worry	Boys: -0.24 Girls: -0.14	Multiple regression analysis	>0.05 >0.05	N N
														Overall QoL	Boys: -0.44 Girls: -0.09	Multiple regression analysis	<0.05 >0.05	Y N
														HFS: Behaviour	Boys: 0.12 Girls: 0.15	Multiple regression analysis	>0.05 >0.05	N N
														HFS: worry/fear	Boys: -0.5 Girls: -0.02	Multiple regression analysis	<0.01 >0.05	Y N
														Total HFS	Boys: -0.38 Girls: 0.04	Multiple regression analysis	<0.05 >0.05	Y N
Use of Commonly Available Technologies for Diabetes Information and Self-Management Among Adolescents With Type 1 Diabetes and Their Parents: A Web-Based Survey Study.	Vaala	2015	USA	Outpatient	14.47 (SD 1.65 range :	5.83 years (SD 3.53)	Prospective	Cross-sectional	174	Y	Primary	Cross-sectional (previous 1-2 months)	Self-Care Inventory - Revised (SCI-R)	Household income	0.08	beta	>0.05	N
														Age	-0.18	beta	<0.05	Y
														Non-white adolescent	-0.13	beta	>0.05	N
														Duration of diabetes	0.08	beta	>0.05	N
														Uses social networking	0.18	beta	<0.05	Y
														Uses diabetes websites	0.15	beta	<0.05	Y
														Uses diabetes apps	0.12	beta	>0.05	N
														Uses text messaging	0.11	beta	>0.05	N
														Uses meter/pump software	0.15	beta	<0.05	Y
														Adolescent diabetes technology index	0.23	beta	<0.01	Y
Victimization of youth with type-1 diabetes by teachers: relations with adherence and metabolic control	Peters	2008	USA	Outpatient	12.8 (SD 2.5, range 8-	NK	Prospective	Cross-sectional	167	Y	Primary	Cross-sectional (previous 3-4 months)	Diabetes Self-Management Profile (Harris et al., 2000)	Teacher victimisation	Total sample: -0.135 Age 8-11: -0.343 Age 12-17: -0.112	NK	>0.05 <0.01 >0.05	N Y N
														HbA1c	Total sample: -0.159 Age 8-11: -0.072 Age 12-17: -0.154	NK	<0.05 >0.05 >0.05	Y N N
														DSMP subscale: exercise	Total sample: 0.245 Age 8-11: 0.234 Age 12-17: 0.219	NK	<0.01 <0.05 <0.05	Y Y Y
														DSMP hypoglycaemia subscale: diet	Total sample: 0.403 Age 8-11: 0.407 Age 12-17: 0.388	NK	<0.01 <0.01 <0.05	Y Y Y
														DSMP subscale: hypoglycaemia management	Total sample: 0.154 Age 8-11: 0.061 Age 12-17: 0.185	NK	<0.05 >0.05 <0.05	Y N Y
														DSMP subscale: glucose testing	Total sample: 0.309 Age 8-11: 0.176 Age 12-17: 0.3	NK	<0.01 >0.05 <0.05	Y N Y
														Total DSMP score	Total sample: 0.65 Age 8-11: 0.667 Age 12-17: 0.629	NK	<0.01 <0.01 <0.05	Y Y Y

Study Title	Lead Author	Year	Country	Setting (dropdown of inpatient, outpatient, intensive care, primary care, healthy participants)	Mean Age of Participants (include range or SD if given)	Mean duration of diabetes at start of study	Prospective, Retrospective, not known	Study Design (RCT, Cohort, Case Control, Case report)	Sample	Adherence to insulin therapy assessed (Y/N)	Primary, secondary outcome or not known	Over what time did they assess the patients' adherence (days/weeks/ months)	How did they measure adherence?	Factor assessed for association with adherence (please list all captured by study team). Please use a new row for each variable tested for association with adherence	Effect on adherence - how did each factor alter the use of insulin (numerical)	Statistical test	P value	Statistically significant (Y/N)
White Coat Adherence in Pediatric Patients with Type 1 Diabetes Who Use Insulin Pumps	Driscoll	2016	USA	Outpatient	13.15 (SD 3.13, range	7.06 years (SD 3.3 years, range 1.22-15.4 years)	Retrospective	Cross-sectional	98	Y	Primary	Previous 2-3 months	Bolus data downloaded from pumps	Boluses delivered day before clinic visit (designed to assess white coat adherence)	Visit 1: -0.06 Visit 2: -0.096	Linear mixed models	<0.0001 <0.0001	Y Y
															Visit 1: -0.271		<0.01	Y
														Age	Visit 2: -0.243	Linear mixed models	<0.01	Y
														Boluses delivered day before clinic visit x age	Visit 1: 0.0027 Visit 2: 0.005	Linear mixed models	<0.0001 <0.0001	Y Y
French version of a scale evaluating adherence to diabetes regimen in children.	Moret	1995	France	Outpatient	10.2(SD1.9, range 7-1	3,1 (SD 2,7)	Not Known	Cohort study	165	y	primary	1 month	the insulin adjustment score; questionnaire and 1 month after measurement of biological hypoglycemia and hypoglycemic conditions	Hypoglycaemia	-0.23	pearson correlation	<0.01	Y
														Age	0.28	pearson correlation	<0.001	Y
														Age at diagnosis	0.18	pearson correlation	<0.05	Y
														Diabetes knowledge	0.47	pearson correlation	<0.001	Y
psychological impactof continuous subcutaneous insuline infusion pump therapyin non-selected newly diagnosed insulin dependent (type1) diabetic children: evaluation after two years of therapy	Slijper	1990	The Netherlands	Outpatient	CSII (continuous subcutaneanous insulin infusion pump therapy): 9 (SD 4) CT(conventional injection therapy): 7 (SD 4)	Not Known	Not Known	Cohort study	34	y	primary	follow up for all children was monthly for 2 years	Questionnaire	CSII vs MDI and intelligence	no significant difference for WISC-R or WIPPSI test (intelligence tests)	wilcoxon mann whitney	ns	No
															CSII patients had better compliance	wilcoxon mann whitney	p<0.05	y
Worries and difficulties identified by young puerto ricans with insulindependen diabetes mellitus; related to metabolic control, despair, social support and depression symptoms (Difficulties in Puerto Rican youth with diabetes)	Jeannette Rossello	2006	Puerto Rico	Outpatient	8-17 years old (mean age 12.29)	NK	Retrospective	Case control	101	y	Primary	Cross-sectiona	Questionnaire	Depressive state in children/teen	0.342	Not specified, frequen	p<0.01	y
														Dispair or lack of hope	0.429	Not specified, frequen	p<0.01	y
														Social support	-0.277	Not specified, frequen	p<0.01	y
Diabetes Care in insulindependent patients: Effects of a program to change parents behaviour	Jose Olivares	1997	Spain	Outpatient	parents 32-50 years (mean age 39.529) children 9-12 years	patients divided in 2 groups (experimental	Prospective	cohort/ RCT	36	y	Secondary	8 weeks	Questionnaire	Therapeutic knowledge	F=87.085, TE=2.709	ANCOVA	p=0.000	y
														shared responsibility children-pa	F=139,054, TE=2.837	ANCOVA	p=0.000	y
														blood glucose	F=5.008, TE=-0.869	ANCOVA	p=0.033	y

Study Title	Lead Author	Year	Country	Setting (dropdown of inpatient, outpatient, intensive care, primary care, healthy participants)	Mean Age of Participants (include range or SD if given)	Mean duration of diabetes at start of study	Prospective, Retrospective, not known	Study Design (RCT, Cohort, Case Control, Case report)	Sample	Adherence to insulin therapy assessed (Y/N)	Primary, secondary outcome or not known	Over what time did they assess the patients' adherence (days/weeks/ months)	How did they measure adherence?	Factor assessed for association with adherence (please list all captured by study team). Please use a new row for each variable tested for association with adherence	Effect on adherence - how did each factor alter the use of insulin (numerical)	Statistical test	P value	Statistically significant (Y/N)
Algemene ouder-kindrelatie en diabetesgerelateerde ouder-kindrelatie in de adolescentie: Relatie met glykemische controle en de rol van adherenceGeneral parent-child relationship and diabetes-related parent-child relationship in adolescence	van Dongen	2005	Netherla	Outpatient	12.7 (SD 1.6, range 10	65 months (SD 36.4 months, range 4-142 months)	Prospective	Cohort study	53	Y	primary	NK	Insulin required of adherence scale (HBGM also assessed; strongly correlated so added together)	Age	-0.4	NK	<0.01	Y
														Gender	-0.2	NK	>0.05	N
														Parent-child relationship	CR: 0.49	NK	<0.01	Y
															PR:0.38	NK	<0.01	Y
														Conflict	CR: -0.38	NK	<0.01	Y
															PR: -0.39	NK	<0.01	Y
														Child is responsible	CR: -0.3	NK	<0.05	Y
															PR: -0.31	NK	<0.05	Y
														Both are responsible	CR: 0.3	NK	<0.05	Y
															PR: 0.32	NK	<0.05	Y
														Parent is responsible	CR: 0.01	NK	>0.05	N
															PR: 0.01	NK	>0.05	N

Appendix 2 Data extraction tool. Studies below the red line are foreign language studies and were extracted by native speakers.

			Introduction	Methods											Results					Discussion		Other		
Title	Author	Year	1) Were the aims/objectives of the study clear?	2) Was the study design appropriate for the stated aim(s)?	3) Was the sample size justified?	4) Was the target/reference population clearly defined? (Is it clear who the research was about?)	5) Was the sample frame taken from an appropriate population base so that it closely represented the target/reference population under	6) Was the selection process likely to select subjects/participants that were representative of the target/reference population under	7) Were measures undertaken to address and categorise non-responders?	8) Were the risk factor and outcome variables measured appropriate to the aims of the study?	9) Were the risk factor and outcome variables measured correctly using instruments/measurements that had been trialled, piloted or published	10) Is it clear what was used to determined statistical significance and/or precision estimates? (eg, p values, CIs)	11) Were the methods (including statistical methods) sufficiently described to enable them to be repeated?	12) Were the basic data adequately described?	13) Does the response rate raise concerns about non-response bias?	14) If appropriate, was information about non-responders described?	15) Were the results internally consistent?	16) Were the results for the analyses described in the methods, presented?	17) Were the authors' discussions and conclusions justified by the results?	18) Were the limitations of the study discussed?	19) Were there any funding sources or conflicts of interest that may affect the authors' interpretation of results?	20) Was ethical approval or consent of participants attained?	Total responses reducing risk of bias (/20)
Adolescents' health attitudes and adherence to treatment for insulin-dependent diabetes mellitus	Palardy	1998	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NK	Yes	18
Association of insulin-manipulation and psychiatric disorders: A systematic epidemiological evaluation of adolescents with type 1 diabetes in Austria	Berger	2019	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	19
Associations between major life events and adherence, glycemic control, and psychosocial characteristics in teens with type 1 diabetes.	Commiss	2018	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	17
Comparison of usability and patient preference for the new disposable insulin device solostar versus flexpen, lilly disposable pen, and a prototype pen: an open-label study	Haak	2007	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	NK	No	NK	Yes	Yes	No	NK	Yes	13
Compliance of adolescents with diabetes	Kyngas	2000	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NK	No	Yes	Yes	Yes	No	NK	NK	14
Coping styles in youths with insulin-dependent diabetes mellitus	Hanson	1989	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	NK	Yes	16
Crisis intervention program in newly diagnosed diabetic children.	Galatzer	1982	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NK	Yes	18
Development and validity testing of the revised diabetes self-care inventory for children and adolescents	Nakamu	2019	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	17
Eating patterns in adolescents with type 1 diabetes: Associations with metabolic control, insulin omission, and eating disorder pathology.	Wisting	NK	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	No	Yes	19
Empirical validation for a family-centered model of care	Hanson	1995	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NK	No	Yes	Yes	Yes	No	NK	Yes	15
Environmental factors affecting management of type 1 diabetes in children below the age of 10.	Piechow	2017	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NK	No	Yes	Yes	Yes	No	NK	Yes	15
Executive functioning, parenting stress, and family factors as predictors of diabetes management in pediatric patients with type 1 diabetes using intensive regimens	Smith	2014	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	NK	NK	16

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Father-absent adolescents with insulin-dependent diabetes mellitus: A population at risk?	Hanson	1988	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	No	Yes	16
Hope and mealtime insulin boluses are associated with depressive symptoms and glycemic control in youth with type 1 diabetes mellitus	Calkins-S	2018	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No	Yes	18
I get by with a little help from my family and friends: Adolescents' support for diabetes care	La Greca	1995	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NK	No	Yes	Yes	Yes	Yes	NK	Yes	16
Illness perceptions and self efficacy beliefs in adolescents and young adults with insulin dependent diabetes mellitus	Griva	2000	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NK	Yes	19
Impact of family environment and support on adherence, metabolic control, and quality of life in adolescents with diabetes.	Pereira	2008	No	NK	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	NK	No	Yes	Yes	Yes	Yes	NK	Yes	13
Insulin bolusing software: The potential to optimize health outcomes in type 1 diabetes mellitus	Driscoll	2013	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NK	No	NK	Yes	Yes	Yes	No	Yes	16
Model of associations between psychosocial variables and health-outcome measures of adolescents with IDDM	Hanson	1987	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NK	No	Yes	Yes	Yes	Yes	No	NK	16
Parent and child perceptions of the management of juvenile diabetes	Allen	1983	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NK	No	Yes	Yes	Yes	No	NK	NK	13
Parent-child relationships and the management of insulin-dependent diabetes mellitus	Miller-Johnso	1994	No	NK	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	NK	NK	14
Parental involvement and adolescents' diabetes management: the mediating role of self-efficacy and externalizing and internalizing behaviors.	Berg	2011	No	NK	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No	Yes	17
Personality traits as predictors of adherence in adolescents with type I diabetes	Wheeler	2012	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NK	No	NK	Yes	Yes	Yes	NK	Yes	14
Poor adherence to integral daily tasks limits the efficacy of CSII in youth	O'Conne	2011	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NK	No	NK	Yes	Yes	No	No	Yes	15
Predictors of good adherence of adolescents with diabetes (insulin-dependent diabetes mellitus)	Kyngas	2007	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NK	No	Yes	Yes	Yes	Yes	NK	Yes	16

			Introduction	Methods										Results					Discussion		Other		
Title	Author	Year	1) Were the aims/objectives of the study clear?	2) Was the study design appropriate for the stated aim(s)?	3) Was the sample size justified?	4) Was the target/reference population clearly defined? (Is it clear who the research was about?)	5) Was the sample frame taken from an appropriate population base so that it closely represented the target/reference population under	6) Was the selection process likely to select subjects/participants that were representative of the target/reference population under	7) Were measures undertaken to address and categorise non-responders?	8) Were the risk factor and outcome variables measured appropriate to the aims of the study?	9) Were the risk factor and outcome variables measured correctly using instruments/ measurements that had been trialled, piloted or published	10) Is it clear what was used to determined statistical significance and/or precision estimates? (eg, p values, CIs)	11) Were the methods (including statistical methods) sufficiently described to enable them to be repeated?	12) Were the basic data adequately described?	13) Does the response rate raise concerns about non-response bias?	14) If appropriate, was information about non-responders described?	15) Were the results internally consistent?	16) Were the results for the analyses described in the methods, presented?	17) Were the authors' discussions and conclusions justified by the results?	18) Were the limitations of the study discussed?	19) Were there any funding sources or conflicts of interest that may affect the authors' interpretation of results?	20) Was ethical approval or consent of participants attained?	Total responses reducing risk of bias (/20)
The relationship between negative communication and body image dissatisfaction in adolescent females with type 1 diabetes mellitus	Kichler	2008	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	NK	No	Yes	Yes	Yes	Yes	NK	Yes	15
The role of health beliefs in the regimen adherence and metabolic control of adolescents and adults with diabetes mellitus	Brownle	1987	No	NK	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NK	Yes	17
Type 1 diabetes among adolescents: Reduced diabetes self-care caused by social fear and fear of hypoglycemia	Di Battis	2009	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NK	No	Yes	Yes	Yes	Yes	NK	Yes	16
Use of Commonly Available Technologies for Diabetes Information and Self-Management Among Adolescents With Type 1 Diabetes and Their Parents: A Web-Based Survey Study.	Vaala	2015	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	17
Victimization of youth with type-1 diabetes by teachers: relations with adherence and metabolic	Peters	2008	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NK	No	Yes	Yes	Yes	Yes	No	Yes	17
White Coat Adherence in Pediatric Patients with Type 1 Diabetes Who Use Insulin Pumps	Driscoll	2016	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	NK	Yes	Yes	Yes	No	Yes	17

			Introduction	Methods											Results					Discussion		Other		
Title	Author	Year	1) Were the aims/objectives of the study clear?	2) Was the study design appropriate for the stated aim(s)?	3) Was the sample size justified?	4) Was the target/reference population clearly defined? (Is it clear who the research was about?)	5) Was the sample frame taken from an appropriate population base so that it closely represented the target/reference population under	6) Was the selection process likely to select subjects/participants that were representative of the target/reference population under	7) Were measures undertaken to address and categorise non-responders?	8) Were the risk factor and outcome variables measured appropriate to the aims of the study?	9) Were the risk factor and outcome variables measured correctly using instruments/ measurements that had been trialled, piloted or published	10) Is it clear what was used to determined statistical significance and/or precision estimates? (eg, p values, CIs)	11) Were the methods (including statistical methods) sufficiently described to enable them to be repeated?	12) Were the basic data adequately described?	13) Does the response rate raise concerns about non-response bias?	14) If appropriate, was information about non-responders described?	15) Were the results internally consistent?	16) Were the results for the analyses described in the methods, presented?	17) Were the authors' discussions and conclusions justified by the results?	18) Were the limitations of the study discussed?	19) Were there any funding sources or conflicts of interest that may affect the authors' interpretation of results?	20) Was ethical approval or consent of participants attained?	Total responses reducing risk of bias (/20)
Prevalence of intentional under- and overdosing of insulin in children and adolescents with type 1 diabetes	Schober	2011	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NK	No	NK	Yes	Yes	Yes	NK	Yes	15
Psychometric evaluation of the adherence in diabetes questionnaire	Kristens	2012	No	NK	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	18
Relationship of self-efficacy and binging to adherence to diabetes regimen among adolescents	Littlefiel	1992	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NK	No	Yes	Yes	Yes	Yes	NK	Yes	16
Risk factors for poor glycemic control in diabetic children in France.	Tubiana	1995	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	NK	No	Yes	Yes	Yes	Yes	NK	Yes	15
Self-efficacy as a mediator variable for adolescents' adherence to treatment for insulin-dependent diabetes mellitus	Ott	2000	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NK	No	Yes	Yes	Yes	Yes	NK	Yes	16
Sleep duration and its impact on adherence in adolescents with type 1 diabetes mellitus	McDonou	2017	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	NK	Yes	17
Social competence and parental support as mediators of the link between stress and metabolic control in adolescents with insulin-dependent diabetes mellitus	Hanson	1987	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	NK	Yes	16
Survey of insulin site rotation in youth with type 1 diabetes mellitus.	Patton	2010	No	NK	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	No	No	NK	Yes	Yes	Yes	No	Yes	14
The Diabetes Social Support Questionnaire-Family Version: Evaluating adolescents' diabetes-specific support from family members	La Greca	2002	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes	No	No	Yes	Yes	Yes	Yes	No	Yes	16
The Effect of Family-centered Care on Management of Blood Glucose Levels in Adolescents with Diabetes.	Cheraghi	2015	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NK	No	Yes	Yes	Yes	Yes	No	Yes	17
The health belief model and adolescents with insulin-dependent diabetes mellitus	Bond	1992	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	NK	No	Yes	Yes	Yes	No	NK	NK	12
The impact of mothers' sense of empowerment on the metabolic control of their children with juvenile diabetes	Florian	1998	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NK	No	Yes	Yes	Yes	No	NK	Yes	15
The Interactive Effect of Diabetes Family Conflict and Depression on Insulin Bolusing Behaviors for Youth	Maliszev	2017	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NK	No	Yes	Yes	Yes	Yes	No	Yes	17

Appendix 3 Appraisal Tool for Cross-Sectional Studies (AXIS) and results for all cross-sectional studies.

Domain	Question	Options	Star awarded?
Selection	1) Is the case definition adequate?	a) Yes, with independent validation	Yes
		b) Yes, e.g.- record linkage or based on self-reports	No
		c) No description	No
	2) Representativeness of the cases.	a) Consecutive or obviously representative series of cases	Yes
		b) Potential for selection biases or not stated	No
	3) Selection of controls.	a) Community controls	Yes
		b) Hospital controls	No
		c) No description	No
	4) Definition of controls.	a) No history of disease (endpoint)	Yes
		b) No description of source	No
Comparability	1) Comparability of cases and controls on the basis of the design or analysis.	a) Study controls for most important factor	Yes
		b) Study controls for any additional factor	Yes
Exposure	1) Ascertainment of exposure.	a) Secure record (e.g.- surgical record)	Yes
		b) Structured interview where blind to case/control status	Yes
		c) Interview not blinded to case/control status	No
		d) Written self-report or medical record only	No
		e) No description	No
	2) Same method of ascertainment for cases and controls.	a) Yes	Yes
		b) No	No
	3) Non-response rate.	a) Same rate for both groups	Yes
		b) Non-respondents described.	No
		c) Rate different and no designation.	No

Appendix 4 Newcastle-Ottawa Scale for bias assessments of case-control studies.

Title	Author	Year	NOS Case-control Bias Assesment: Selection (Answers and star rating /4)	NOS Case-control Bias Assesment: Comparability (star rating /2)	NOS Case-control Bias Assesment: Exposure (Answers and star rating /3)	Total star rating /9
Pathways from emotional adjustment to glycemic control in youths with diabetes in Hong Kong	Stewart	2000	1) a. 2) a. 3) a. 4) a. ****	**	1) a. 2) a. 3) a. ***	9
Quality of life of children and adolescents with type 1 diabetes in Kuwait.	Abdul-Rasoul	2013	1) a. 2) a. 3) a. 4) a. ****	**	1) a. 2) a. 3) a. ***	9

Appendix 5 Completed case-control study Newcastle-Ottawa scale bias assessments.

Domain	Question	Options	Star awarded?
Selection	1) Representativeness of the exposed cohort.	a) Truly representative of the average cohort in the community	Yes
		b) Somewhat representative of the average cohort in the community	Yes
		c) Selected group of users, e.g.- nurses, volunteers	No
		d) No description of the derivation of the cohort	No
	2) Selection of the non-exposed cohort.	a) Drawn from the same community as the exposed cohort	Yes
		b) Drawn from a different source	No
		c) No description of the derivation of the non-exposed cohort	No
	3) Ascertainment of exposure.	a) Secure record (e.g.- surgical records)	Yes
		b) Structured interview	Yes
		c) Written self-report	No
		d) No description	No
	4) Demonstration that the outcome of interest was not present at the start of the study.	a) Yes	Yes
		b) No	No
Comparability	1) Comparability of cohorts on the basis of the design or analysis.	a) Study controls for most important factor	Yes
		b) Study controls for any additional factor	Yes
Outcome	1) Assessment of outcome.	a) Independent blind assessment	Yes
		b) Record linkage	Yes
		c) Self-report	No
		d) No description	No
		e) No description	No
	2) Was follow-up long enough for outcomes to occur?	a) Yes	Yes
		b) No	No
	3) Adequacy of follow-up of cohorts.	a) Complete follow-up; all subjects accounted for	Yes
		b) Subjects lost to follow-up unlikely to introduce bias; small number lost to follow-up or description provided of those lost	Yes
		c) Follow up rate low enough to potentially result in bias and no description of those lost	No
		d) No statement	No

Appendix 6 Newcastle-Ottawa scale for bias assessments of cohort studies.

Title	Author	Year	NOS Cohort: Selection. Answers and star rating (/4 stars)	NOS Cohort: Comparability (/2 stars)	NOS Cohort: Outcome answers and star rating (/3 stars)	NOS Total (/9 stars)
Adherence among children and adolescents with insulin-dependent diabetes mellitus over a four-year longitudinal follow-up: I. The influence of patient coping and	Jacobson	1990	1) a. 2) b. 3) c. 4) a. ***	**	1) c. 2) a. 3) d. *	6
Adherence among children and adolescents with insulin-dependent diabetes mellitus over a four-year longitudinal follow-up: II. Immediate and long-term linkages with	Hauser	1990	1) b. 2) a. 3) c. 4) a. ***	**	1) c. 2) a. 3)b. **	7
Adherence to IDDM regimens: relationship to psychosocial variables and metabolic control.	Schafer	1983	1) b. 2) a. 3) c. 4) a. ***	*	1) c. 2) a. 3) d. *	5
Adherence to Insulin Pump Behaviors in Young Children with Type 1 Diabetes Mellitus	Patton	2017	1) b. 2) a. 3) a. 4) a. ****	*	1) b. 2) a. 3) b. **	8
Adherence to insulin treatment in children with type I diabetes mellitus at a hospital in Malaysia	Ying	2017	1) a. 2) a. 3) a. 4) a. ****	/	1) b. 2) a. 3) b. **	7
Adherence to insulin treatment, glycaemic control, and ketoacidosis in insulin-dependent diabetes mellitus	Morris	1997	1) a. 2) a. 3) a. 4) a. ****	**	1) b. 2) a. 3) d. **	8
Adherence-health status relationships in childhood diabetes	Johnson	1990	1) b. 2) a. 3) a. 4) a. ****	*	1) b. 2) a. 3) b. ***	8
Assessing family sharing of diabetes responsibilities.	Anderson	1990	1) a. 2) a. 3) b. 4) a. ****	**	1) c. 2) a. d. **	7
Benefits of using the I-port system on insulin-treated patients	Khan	2019	1) b. 2) a. 3) b. 4) a. ****	**	1) c. 2) a. 3) d. *	7
Brief report: Maternal posttraumatic stress symptoms are related to adherence to their child's diabetes treatment regimen.	Horsch	2014	1) b. 2) a. 3) b. 4) a. ****	*	1) c. 2) a. 3) d. *	6
Brief report: Parent's health literacy among high-risk adolescents with insulin dependent diabetes	Janisse	2010	1) b. 2) a. 3) b. 4) a. ****	**	1) c. 2) a. 3) b. **	8
Depressive symptoms, daily stress, and adherence in late adolescents with type 1 diabetes.	Baucom	2015	1) a. 2) a. 3) c. d) a. ***	**	1) c. 2) a. 3) d. *	6

Title	Author	Year	NOS Cohort: Selection. Answers and star rating (/4 stars)	NOS Cohort: Comparability (/2 stars)	NOS Cohort: Outcome answers and star rating (/3 stars)	NOS Total (/9 stars)
Engagement with a Text-Messaging Intervention Improves Adherence in Adolescents with Type 1 Diabetes: Brief Report.	Zhang	2018	1) b. 2) a. 3) a. 4) a. ****	**	1) b. 2) a. 3) b. ***	9
Health-risk behaviors and type 1 diabetes outcomes in the transition from late adolescence to early emerging adulthood	Lee Tracy	2019	1) a. 2) a. 3) c. 4) a. ***	*	1) a. 2) a. 3) d. **	6
Illness representations predict adherence in adolescents and young adults with type 1 diabetes	McGrady	2014	1) b. 2) a. 3) c. 4) a. ***	**	1) c. 2) a. 3) b. **	7
Longitudinal associations of maternal depressive symptoms, maternal involvement, and diabetes management across adolescence.	Wiebe	2011	1) b. 2) a. 3) c. 4) a. ***	*	1) c. 2) b. 3) d. *	5
Psychologic predictors of compliance in children with recent onset of diabetes mellitus	Jacobson	1987	1) a. 2) a. 3) c. 4) a. ***	**	1) c. 2) a. 3) d. *	6
Psychometric evaluation of the adherence in diabetes questionnaire	Kristensen	2012	1) a. 2) a. 3) c. 4) a. ***	**	1)	
Satisfaction and quality of life with premeal inhaled versus injected insulin in adolescents and adults with type 1 diabetes	Testa	2007	1) b. 2) a. 3) a. 4) a. ****	**	1) c. 2) a. 3) d. *	7

Appendix 7 Completed cohort study Newcastle-Ottawa Scale bias assessments.

Domain	Questions	Howells, 2002	Franklin, 2006	Glaser, 2004	Gregory, 2011	Mendez, 1997	Abolfotouh, 2011	Jones, 2002
Domain 1: Randomisation process	1.1) Was the allocation sequence random?	Y	Y	Y	Y	NI	N	Y
	1.2) Was the allocation sequence concealed until participants were enrolled and assigned to interventions?	Y	PY	PY	PY	NI	PN	PY
	1.3) Did baseline differences between intervention groups suggest a problem with the randomisation process?	PN	N	PN	PN	N	N	PN
	Overall risk of bias for this domain	Low	Low	Low	Low	Some concerns	High	Low
Domain 2: Deviation from intended interventions	2.1) Were participants aware of their assigned intervention during the trial?	PY	PY	PY	PY	PY	PY	PY

Domain	Questions	Howells, 2002	Franklin, 2006	Glaser, 2004	Gregory, 2011	Mendez, 1997	Abolfotouh, 2011	Jones, 2002
	2.2) Were carers and people delivering the interventions aware of participants' assigned intervention during the trial?	Y	Y	PY	PY	PY	Y	PY
	2.3) If Y/PY/NI to 2.1 or 2.2: Were there deviations from the intended intervention that arose because of the experimental context?	PN	PN	PN	PN	PN	PY	PN
	2.4) If Y/PY to 2.3: Were these deviations likely to have affected the outcome?	N/A	N/A	N/A	N/A	N/A	PN	N/A
	2.5) If Y/PY/NI to 2.4: Were these deviations from intended intervention balanced between groups?	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	2.6) Was an appropriate analysis used to estimate the effect of assignment to intervention?	Y	Y	Y	PY	PY	PY	PY

Domain	Questions	Howells, 2002	Franklin, 2006	Glaser, 2004	Gregory, 2011	Mendez, 1997	Abolfotouh, 2011	Jones, 2002
	2.7) If N/PN/NI to 2.6: Was there potential for a substantial impact (on the result) of the failure to analyse participants in the group to which they were randomized?	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Overall risk of bias for this domain	High	Low	Low	Low	Low	Some concerns	Low
Domain 3: Missing outcome data	3.1) Were data for this outcome available for all, or nearly all, participants randomised?	Y	Y	PN	Y	PY	NI	y
	3.2) If N/PN/NI to 3.1: is there evidence that the result was not biased by missing outcome data?	N/A	N/A	PN	N/A	N/A	PY	N/A
	3.3) If N/PN to 3.2: could missingness in the outcome depend on its true value?	N/A	N/A	PN	N/A	N/A	N/A	N/A
	3.4) If Y/PY/NI to 3.3: Is it likely that missingness in the outcome depended on its true value?	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Domain	Questions	Howells, 2002	Franklin, 2006	Glaser, 2004	Gregory, 2011	Mendez, 1997	Abolfotouh, 2011	Jones, 2002
	Overall risk of bias for this domain	Low	Low	Low	Low	Low	Low	Low
Domain 4: Measurement of the outcome	4.1) Was the method of measuring the outcome inappropriate?	PN	PN	PN	PN	PN	PN	PN
	4.2) Could measurement or ascertainment of the outcome have differed between intervention groups?	PN	PN	PN	PN	PN	PN	PN
	4.3) If N/PN/NI to 4.1 and 4.2: Were outcome assessors aware of the intervention received by study participants?	PY	PY	PY	PY	PY	PY	PY
	4.4) If Y/PY/NI to 4.3: Could assessment of the outcome have been influenced by knowledge of intervention received?	PY	PY	PN	PN	PY	PN	PN

Domain	Questions	Howells, 2002	Franklin, 2006	Glaser, 2004	Gregory, 2011	Mendez, 1997	Abolfotouh, 2011	Jones, 2002
	4.5) If Y/PY/NI to 4.4: Is it likely that assessment of the outcome was influenced by knowledge of intervention received?	PN	PN	N/A	N/A	PN	N/A	N/A
	Overall risk of bias for this domain	Some concerns	Some concerns	Low	Low	Some concerns	Low	Low
Domain 5: Selection of the reported result	5.1) Were the data that produced this result analysed in accordance with a pre-specified analysis plan that was finalized before unblinded outcome data were available for analysis?	Y	PY	Y	Y	PY	Y	Y
	5.2) Is the numerical result being assessed likely to have been selected on the basis of the results from multiple eligible outcome measurements (e.g. scales, definitions, time points) within the outcome domain?	Y	Y	Y	PN	PY	PY	PN

Domain	Questions	Howells, 2002	Franklin, 2006	Glaser, 2004	Gregory, 2011	Mendez, 1997	Abolfotouh, 2011	Jones, 2002
	5.3) Is the numerical result being assessed likely to have been selected on the basis of the results from multiple eligible analyses of the data?	PY	PY	PY	PN	PY	PY	PN
	Overall risk of bias for this domain	High	High	High	Low	High	High	Low
Overall risk of bias		High	Some concerns	Some concerns	Low	High	High	Low

Appendix 8 Completed Cochrane risk of bias for randomised trials tool (RoB 2) for RCTs included in systematic review. Legend; Y: yes, PY: probably yes, NI: no information, PN: probably no, N: no, N/A: not applicable.

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1. "I Don't Want Them to Feel Different": A Mixed Methods Study of Parents' Beliefs and Dietary Management Strategies for Their Young Children with Type 1 Diabetes Mellitus.	Title	Intervention: not related to insulin treatment
2. "Sweet Talk": Text Messaging Support for Intensive Insulin Therapy for Young People with Diabetes	Full Text	Outcome: not related to insulin treatment adherence
4. "Symptom-based insulin adjustment for glucose normalization" (SIGN) algorithm: a pilot study.	Title	Outcome: not related to insulin treatment adherence
5. 'Diabulima' through the lens of social media: a qualitative review and analysis of online blogs by people with Type 1 diabetes mellitus and eating disorders.	Title	Outcome: not related to insulin treatment adherence
6. 'It's not for me'-patterns of glycaemia in youth who discontinue CSII	Abstract	Wrong study type (review, conference abstract etc.)
7. 640g minimed system effectiveness in children and adolescents with type 1 diabetes: Education plus technology ensure higher %time in target range (70-160 mg/dl)	Title	Intervention: not related to insulin treatment
8. [Analysis of the quality of primary therapeutic-preventive care rendered to patients with type I diabetes mellitus].	Title	Outcome: not related to insulin treatment adherence
9. [Basal bolus therapy in adolescent diabetic patients].	Abstract	Outcome: not related to insulin treatment adherence
10. [Clinical evaluation of glycohemoglobin and serum glycoproteins using affinity chromatography in children with type I diabetes mellitus].	Title	Outcome: not related to insulin treatment adherence
11. [Compliance of children and adolescents with type 1 diabetes (juvenile diabetes mellitus)].		

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
13. [Compliance of young diabetic patients with therapeutic regimens and participation by the family].		
14. [Current and future care for diabetes in children: from insulin to immunotherapy].	Abstract	Wrong study type (review, conference abstract etc.)
15. [Current aspects in therapy of insulin-dependent diabetes mellitus in children and adolescents].	Full Text	Wrong study type (review, conference abstract etc.)
16. [Daytime flexible application of Insulin degludec in patients with type 1 diabetes or type 2 diabetes].	Abstract	Outcome: not related to insulin treatment adherence
18. [Development and outcome of motivational support during inpatient education of insulin-dependent diabetic patients--a pilot project].	Full Text	Population: not children (adults/foetuses)
19. [Diabetes mellitus and cellular immunity].	Title	Outcome: not related to insulin treatment adherence
20. [Diet composition along the evolution of type 1 diabetes mellitus].	Title	Outcome: not related to insulin treatment adherence
21. [Evaluation of a program for the care of the diabetic. A 40-month continuity study].	Abstract	Population: not children (adults/foetuses)
22. [Exploration of left ventricular function in insulin-dependent diabetics (relation with retinopathy)].	Title	Outcome: not related to insulin treatment adherence
23. [French version and validation of a scale evaluating compliance in diabetic children].	Included	
24. [Glibenclamide instead of insulin: a new chance for MODY 3 type diabetes patients: case report].	Title	Population: do not have T1DM
26. [How I assess ... home glycemic control in diabetic patients].	Title	Outcome: not related to insulin treatment adherence
27. [Hypoglycemia provoked by clandestine injections of insulin in the diabetic child].	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
28. [Insulin pump treatment in children and adolescents with type 1 diabetes].	Abstract	Wrong study type (review, conference abstract etc.)
29. [Intensified conventional insulin therapy. The long-term successes and reasons for failure of this therapeutic concept].	Full Text	Population: not children (adults/foetuses)
31. [Intensive insulin therapy in adolescents with type 1 diabetes mellitus: initial experiences with a semiautomatic insulin injection device (the insulin pen)].		
32. [Juvenile onset diabetes: the effect of education for metabolic control].	Abstract	Outcome: not related to insulin treatment adherence
34. [Mauriac syndrome--a rare complication of type 1 diabetes mellitus].	Title	Outcome: not related to insulin treatment adherence
35. [Modern methods for controlling type-1 diabetes?].	Title	Outcome: not related to insulin treatment adherence
36. [Needs of schoolchildren with type 1 diabetes in Extremadura: Family perceptions].	Abstract	Outcome: not related to insulin treatment adherence
37. [New aspects of the diet in type 1 diabetes mellitus].	Title	Intervention: not related to insulin treatment
38. [Predictors of treatment adherence in children with type 1 diabetes mellitus].	Full Text	Wrong study type (review, conference abstract etc.)
39. [Psychological aspects of treatment compliance in the insulin- dependent diabetic child].		
40. [Psychological factors associated to patient's treatment compliance in Chilean diabetic teenagers].		
41. [Quality of diabetes care in Norwegian general practice].	Title	Outcome: not related to insulin treatment adherence
42. [Self-monitoring blood glucose in type 2 diabetes: for whom? And why? Which proofs?].	Title	Population: do not have T1DM

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
43. [Self-monitoring of blood glucose in type 2 diabetic patients. What could we propose according to their treatment?].	Title	Population: do not have T1DM
44. [The Aide to Juvenile Diabetes Association: its role in the management and education of patients with insulin-dependent diabetes].	Title	Outcome: not related to insulin treatment adherence
45. [The selection of insulin and adjustment of the dosage in diabetic children and adolescents: personal experiences].	Abstract	Outcome: not related to insulin treatment adherence
47. [The usage of the personal insulin pump for treatment of a 7 week infant with neonatal diabetes mellitus].	Title	Outcome: not related to insulin treatment adherence
48. [Therapeutic education regarding type 1 diabetes (DM1)].	Abstract	Outcome: not related to insulin treatment adherence
49. [Treatment of young patients with type 1 diabetes in an adult diabetes clinic].	Title	Population: not children (adults/foetuses)
50. [Why is that the response to treatment of type 1 diabetes is not improving?].	Abstract	Wrong study type (review, conference abstract etc.)
51. A 3-year prospective study of parent-child communication in early adolescents with type 1 diabetes: relationship to adherence and glycemic control.	Full Text	Outcome: not related to insulin treatment adherence
52. A biopsychosocial model of glycemic control in diabetes: stress, coping and regimen adherence.	Abstract	Population: not children (adults/foetuses)
53. A case report of a 14 year old female with a known history of type 1 diabetes mellitus who developed tracheal stenosis as a result of prolonged intubation from diabetic ketoacidosis and subsequently developed acute pancreatitis	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
54. A clinical pilot to assess improvement in health related quality of life (QOL), treatment satisfaction, and glycemic control in adolescents with type 2 diabetes (T2DM) using continuous subcutaneous insulin injection therapy (CSII)	Title	Population: do not have T1DM
55. A comparison of IDeg + IAsp versus IDet + IAsp in subjects with type 1 diabetes: subgroup analysis of Japanese subjects.	Abstract	Population: not children (adults/foetuses)
56. A Comparison of Pharmacokinetic and Pharmacodynamic Properties Between Faster-Acting Insulin Aspart and Insulin Aspart in Elderly Subjects with Type 1 Diabetes Mellitus.	Title	Population: not children (adults/foetuses)
57. A comparison of the use of premixed insulins in pen-injectors with conventional patient-mixed insulin treatment in children and adolescents with IDDM. Is there a decreased risk of night hypoglycemia?	Title	Outcome: not related to insulin treatment adherence
58. A computer insulin titration protocol is associated with a reduction of hypoglycemia in the PIC U	Title	Outcome: not related to insulin treatment adherence
59. A discrete choice experiment evaluation of patients' preferences for different risk, benefit, and delivery attributes of insulin therapy for diabetes management.	Full Text	Population: not children (adults/foetuses)
60. A focus on blood glucose monitoring: relation to glycemic control and determinants of frequency.	Title	Intervention: not related to insulin treatment
61. A group approach to the management of diabetes in adolescents and young adults	Abstract	Population: not children (adults/foetuses)

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
62. A hypnotherapeutic approach to the improvement of compliance in adolescent diabetics.		
63. A Large Difference in Dose Timing of Basal Insulin Introduces Risk of Hypoglycemia and Overweight: A Cross-Sectional Study.	Title	Outcome: not related to insulin treatment adherence
64. A longitudinal analysis of adherence and health status in childhood diabetes	Included	
65. A model for promoting adolescents' adherence to treatment for type 1 diabetes mellitus	Full Text	Wrong study type (review, conference abstract etc.)
66. A multi-disciplinary education process related to the discharging of children from hospital when the child has been diagnosed with type 1 diabetes--a qualitative study.	Abstract	Outcome: not related to insulin treatment adherence
67. A Multidisciplinary Evaluation of a Virtually Supervised Home-Based High-Intensity Interval Training Intervention in People With Type 1 Diabetes.	Abstract	Population: not children (adults/foetuses)
69. A multivariate model exploring the predictive value of demographic, adolescent, and family factors on glycemic control in adolescents with type 1 diabetes.	Full Text	Outcome: not related to insulin treatment adherence
70. A multivariate model of demographic and psychosocial predictors of HBA1c in adolescents with type 1 diabetes	Abstract	Wrong study type (review, conference abstract etc.)
71. A new indwelling catheter, I-PORT advance, to improve adherence to basal-bolus treatment in children and adolescents with type 1 diabetes: A randomized, crossover pilot study comparing glycemic control and satisfaction	Abstract	Wrong study type (review, conference abstract etc.)

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
72. A new paediatric diabetes knowledge test - M-WIKAD development and factor analysis	Title	Outcome: not related to insulin treatment adherence
73. A novel method for measuring patients' adherence to insulin dosing guidelines: introducing indicators of adherence	Included	
74. A novel tool to predict youth who will show recommended usage of diabetes technologies.	Title	Outcome: not related to insulin treatment adherence
75. A pilot study of factors associated with glycaemic control in adults with Type 1 diabetes mellitus on insulin pump therapy.	Title	Population: not children (adults/foetuses)
76. A prime example of high compliance	Abstract	Population: do not have T1DM
77. A profile of self-care behaviors in emerging adults with type 1 diabetes.	Title	Population: not children (adults/foetuses)
78. A prototype of a new noninvasive device to detect nocturnal hypoglycemia in adolescents with type 1 diabetes--a pilot study.	Title	Outcome: not related to insulin treatment adherence
79. A qualitative study exploring patients' experiences regarding insulin pump use.	Abstract	Population: not children (adults/foetuses)
80. A randomized clinical trial aimed at preventing poor psychosocial and glycemic outcomes in teens with type 1 diabetes (T1D).	Full Text	Outcome: not related to insulin treatment adherence
81. A randomized control trial of the effect of negotiated telephone support on glycaemic control in young people with Type 1 diabetes	Included	
83. A randomized controlled trial of Sweet Talk, a text-messaging system to support young people with diabetes	Included	

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
85. A randomized study and open-label extension evaluating the long-term efficacy of pramlintide as an adjunct to insulin therapy in type 1 diabetes.	Title	Outcome: not related to insulin treatment adherence
87. A randomized trial of regular standardized telephone contact by a diabetes nurse educator in adolescents with poor diabetes control.	Full Text	Outcome: not related to insulin treatment adherence
*88. A randomized, crossover pilot study comparing glycemic control and satisfaction with an indwelling catheter (i-port advance) for insulin administration in children and adolescents with type 1 diabetes on basal-bolus treatment**	Full Text	Wrong study type (review, conference abstract etc.)
89. A rare complication of T1DM in a female teenager: Mauriac syndrome?	Title	Outcome: not related to insulin treatment adherence
90. A study of type 1 diabetes mellitus from South India	Abstract	Wrong study type (review, conference abstract etc.)
91. A systematic review of non-genetic predictors and genetic factors of glycated haemoglobin in type 1 diabetes one year after diagnosis.	Title	Outcome: not related to insulin treatment adherence
92. A Systematic Review of Patients' Perspectives on the Subcutaneous Route of Medication Administration	Title	Wrong study type (review, conference abstract etc.)
93. A thematic approach to enhance clinical content in a cell and tissue biology course	Title	Outcome: not related to insulin treatment adherence
94. Abnormal left ventricular diastolic function during cold presser test in uncomplicated insulin-dependent diabetes mellitus	Title	Outcome: not related to insulin treatment adherence
95. Accelerated complications in Type 2 diabetes mellitus: the need for greater awareness and earlier detection.	Title	Population: do not have T1DM

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
96. Accuracy and preference assessment of prefilled insulin pen versus vial and syringe with diabetes patients, caregivers and healthcare professionals.	Abstract	Population: not children (adults/foetuses)
97. Accuracy of blood glucose estimates in adolescents with diabetes mellitus	Title	Outcome: not related to insulin treatment adherence
98. Accuracy of Blood Glucose Meters for Self-Monitoring Affects Glucose Control and Hypoglycemia Rate in Children and Adolescents with Type 1 Diabetes	Title	Outcome: not related to insulin treatment adherence
100. Accuracy of insulin pump therapy usage in pediatric patients with type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
101. Achievement of internationally established metabolic goals in Spanish paediatric patients with type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
102. Achievement of metabolic control among children and adolescents with type 1 diabetes in Spain	Title	Outcome: not related to insulin treatment adherence
103. Achievement of metabolic control goals set by the American Diabetes Association and the International Society for Pediatric and Adolescent Diabetes in pediatric patients with type 1 diabetes from Spain	Title	Outcome: not related to insulin treatment adherence
105. Achieving glycemic control: cornerstone in the treatment of patients with multiple metabolic risk factors.	Title	Outcome: not related to insulin treatment adherence
106. Achieving optimal diabetic control in adolescence: the continuing enigma.	Title	Outcome: not related to insulin treatment adherence
107. Acid peptic disease in children with type I diabetes mellitus: A complicating relationship	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
108. Acute Hyperglycemia Associated with Psychotic Symptoms in a Patient with Type 1 Diabetes Mellitus: A Case Report.	Title	Outcome: not related to insulin treatment adherence
109. Acute painful neuropathy (insulin neuritis) - Case report	Title	Outcome: not related to insulin treatment adherence
110. ADAPTATION EN LANGUE FRANCAISE ET VALIDATION D'UNE ECHELLE MESURANT L'ADHESION AU TRAITEMENT DES ENFANTS DIABETIQUESFrench version of a scale evaluating adherence to diabetes regimen in children	Abstract	Outcome: not related to insulin treatment adherence
111. Adequate prescribing of medication does not necessarily translate into good control of diabetes mellitus.	Abstract	Outcome: not related to insulin treatment adherence
112. Adesao ao tratamento de diabetes mellitus tipo 1 atendidos em um programa especializado em Porto AlegreAdherence to treatment in diabetes mellitus type 1 treated in a specialized program in Porto Alegre	Included	
113. Adherence among children and adolescents with insulin-dependent diabetes mellitus over a four-year longitudinal follow-up: I. The influence of patient coping and adjustment	Included	
114. Adherence among children and adolescents with insulin-dependent diabetes mellitus over a four-year longitudinal follow-up: II. Immediate and long-term linkages with the family milieu	Included	
115. Adherence among Saudi adolescents with type 1 diabetes: A qualitative study	Abstract	Wrong study type (review, conference abstract etc.)
116. Adherence behavior among adolescents with type I insulin-dependent diabetes mellitus: The role of cognitive appraisal processes	Full Text	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
117. Adherence behaviors in research protocols: comparison of two interventions	Abstract	Outcome: not related to insulin treatment adherence
118. Adherence behaviours in Taiwanese children and adolescents with type 1 diabetes mellitus.	Full Text	Outcome: not related to insulin treatment adherence
119. Adherence challenges in the management of type 1 diabetes in adolescents: prevention and intervention.	Full Text	Wrong study type (review, conference abstract etc.)
121. Adherence in adults with type 1 diabetes mellitus correlates with treatment satisfaction but not with adverse events.	Title	Population: not children (adults/foetuses)
122. Adherence is suboptimal in adolescents with type 1 diabetes participating in a clinical trial	Abstract	Outcome: not related to insulin treatment adherence
123. Adherence to a pediatric diabetic ketoacidosis protocol in children presenting to a tertiary care hospital	Title	Outcome: not related to insulin treatment adherence
124. Adherence to blood glucose monitoring in children and young people with type 1 diabetes on insulin pump therapy in a teaching hospital	Title	Outcome: not related to insulin treatment adherence
125. Adherence to clinic visits is not improved by insulin use in metformin-treated children and teens with type 2 diabetes	Title	Population: do not have T1DM
126. Adherence to clinical care guidelines for cystic fibrosis-related diabetes in 659 German/Austrian patients	Title	Population: do not have T1DM
127. Adherence to diabetes care in children and adolescents with type 1 diabetes mellitus in Spain: Results from the chrystal study	Abstract	Wrong study type (review, conference abstract etc.)
128. Adherence to Diet in Youth with Type 1 Diabetes	Title	Outcome: not related to insulin treatment adherence
131. Adherence to guidelines in the treatment of diabetic ketoacidosis in children: A nationwide survey	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
132. Adherence to IDDM regimens: relationship to psychosocial variables and metabolic control.	Included	
133. Adherence To Insulin In Singaporean Pediatric Type 1 Diabetes Patients And Its Association With Glycemic Control And Healthcare Utilization	Abstract	Wrong study type (review, conference abstract etc.)
134. Adherence to Insulin Pen Therapy Is Associated with Reduction in Healthcare Costs Among Patients with Type 2 Diabetes Mellitus.	Title	Population: do not have T1DM
135. Adherence to insulin pump behaviors among young children with type 1 diabetes (T1D): Opportunities for intervention	Abstract	Wrong study type (review, conference abstract etc.)
136. Adherence to Insulin Pump Behaviors in Young Children with Type 1 Diabetes Mellitus	Included	
137. Adherence to insulin pump behaviors in young children with type 1 diabetes mellitus: Opportunities for intervention		
138. Adherence to insulin pump treatment declines with increasing age in adolescents with type 1 diabetes mellitus	Full Text	Outcome: not related to insulin treatment adherence
139. Adherence to insulin therapeutic regimens in patients with type 1 diabetes. A nationwide survey in Brazil.	Full Text	Population: not children (adults/foetuses)
140. Adherence to insulin therapeutic regims in patients with type 1 diabetes. A nationwide survey in brazil-Comment on Gomes et al.	Abstract	Wrong study type (review, conference abstract etc.)
141. Adherence to insulin treatment in children with type I diabetes mellitus at a hospital in Malaysia	Included	
142. Adherence to insulin treatment in diabetes: can it be improved?	Full Text	Wrong study type (review, conference abstract etc.)

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
143. Adherence to insulin treatment, glycaemic control, and ketoacidosis in insulin-dependent diabetes mellitus	Included	
144. Adherence to insulin treatment, glycaemic control, and ketoacidosis in insulin-dependent diabetes mellitus. The DARTS/MEMO Collaboration. Diabetes Audit and Research in Tayside Scotland. Medicines Monitoring Unit.		
145. Adherence to medical regimens	Abstract	Wrong study type (review, conference abstract etc.)
146. Adherence to metformin is reduced during school holidays and weekends in children with type 1 diabetes participating in a randomised controlled trial	Title	Outcome: not related to insulin treatment adherence
147. Adherence to pediatric diabetic ketoacidosis guidelines by community emergency departments' providers	Title	Outcome: not related to insulin treatment adherence
148. Adherence to physical activity in young people with Type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
150. Adherence to self-care and glycaemic control among people with insulin-dependent diabetes mellitus	Full Text	Population: not children (adults/foetuses)
151. Adherence to the ISPAD guidelines 2009 in acute management of diabetic ketoacidosis in children and adolescents in Austria	Title	Outcome: not related to insulin treatment adherence
152. Adherence to the Warsaw School of Pump Therapy and using of different types of boluses for meals in children and adolescent with type 1 diabetes	Abstract	Wrong study type (review, conference abstract etc.)
153. Adherence-health status relationships in childhood diabetes	Included	

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
154. Adherencia al tratamiento en adolescentes diabeticos tipo 1 chilenos: Una aproximacion psicologicaPsychological factors associated to patient's treatment compliance in Chilean diabetic teenagers	Full Text	Outcome: not related to insulin treatment adherence
155. Adolescent adherence in type 1 diabetes	Included	
157. Adolescent non-adherence reveals a genetic cause for diabetes	Abstract	Population: do not have T1DM
159. Adolescent psychosocial development and adherence to treatment for insulin-dependent diabetes mellitus	Abstract	Wrong study type (review, conference abstract etc.)
160. Adolescent use of insulin and patient-controlled analgesia pump technology: A 10-year food and drug administration retrospective study of adverse events	Abstract	Outcome: not related to insulin treatment adherence
161. Adolescents with diabetes and high HbA1c - A neurodevelopmental perspective	Title	Outcome: not related to insulin treatment adherence
162. Adolescents with diabetes: Attitude towards the disease and psychosocial impact	Abstract	Outcome: not related to insulin treatment adherence
163. Adolescents with diabetes: Effects of personal and social factors on risk, health, and illness management behaviors	Abstract	Wrong study type (review, conference abstract etc.)
164. Adolescents' and their parents' views on the acceptability and design of a new diabetes education programme: a focus group analysis.	Abstract	Outcome: not related to insulin treatment adherence
165. Adolescents' health attitudes and adherence to treatment for insulin-dependent diabetes mellitus	Included	

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
166. Adolescents, parents and physicians: a comparison of perspectives on type 1 diabetes self-care.	Full Text	Outcome: not related to insulin treatment adherence
167. Adults with type 1 diabetes eat a high-fat atherogenic diet that is associated with coronary artery calcium.	Title	Population: not children (adults/foetuses)
168. Advances in pharmacological treatment of type 1 diabetes during pregnancy.	Title	Population: not children (adults/foetuses)
169. Advances in transdermal insulin delivery.	Title	Outcome: not related to insulin treatment adherence
170. Adverse events in intensively treated children and adolescents with type 1 diabetes.	Title	Outcome: not related to insulin treatment adherence
171. Adverse lipid and inflammatory changes in young nondiabetic first-degree relatives of type 1-diabetic patients	Title	Outcome: not related to insulin treatment adherence
172. Algemene ouder-kindrelatie en diabetesgerelateerde ouder-kindrelatie in de adolescentie: Relatie met glykemische controle en de rol van adherenceGeneral parent-child relationship and diabetes-related parent-child relationship in adolescence	Included	
173. Alpha-lipoic acid may improve the clinical, endocrine and metabolic features of polycystic ovary syndrome through an insulin-sensitizing effect and an antioxidant action	Title	Population: do not have T1DM
174. Ambulatory 24-hour fast using flexible insulin therapy in patients with type 1 diabetes.	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
175. An analysis of "no effect of insulin pen with memory function on glycemic control in a patient cohort with poorly controlled type 1 diabetes: a randomized open-label study".	Full Text	Wrong study type (review, conference abstract etc.)
176. An analysis on the factors associated with reuse of insulin pen needles in type 2 diabetic patients in China	Title	Population: do not have T1DM
177. An annual review questionnaire in children and young people with type 1 diabetes	Abstract	Wrong study type (review, conference abstract etc.)
178. An approach to prevention of recurrent diabetic ketoacidosis in the pediatric population	Title	Outcome: not related to insulin treatment adherence
179. An audit of insulin usage and insulin injection practices in a large Indian cohort	Abstract	Population: do not have T1DM
180. An audit of the dietary intake of Australian children with type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
181. An evaluation of patient preference for an alternative insulin delivery system compared to standard vial and syringe.	Abstract	Population: not children (adults/foetuses)
182. An exploratory randomised controlled trial using short messaging service to facilitate insulin administration in young adults with type 1 diabetes	Title	Population: not children (adults/foetuses)
184. An intervention to promote family teamwork in diabetes management tasks: Relationships among parental involvement, adherence to blood glucose monitoring, and glycemic control in young adolescents with type 1 diabetes	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
185. Analiz kachestva pervichnoi lechebno-profilakticheskoi pomoshchi bol'nym sakharnym diabetom I tipaAnalysis of the quality of primary therapeutic-preventive care rendered to patients with type I diabetes mellitus	Title	Outcome: not related to insulin treatment adherence
186. Analysis of the NovoPen Echo for the delivery of insulin: a comparison of usability, functionality, and preference among pediatric subjects, their parents, and health care professionals	Abstract	Outcome: not related to insulin treatment adherence
188. Analysis of use of an automated bolus calculator reduces fear of hypoglycemia and improves confidence in dosage accuracy in type 1 diabetes mellitus patients treated with multiple daily insulin injections.	Full Text	Wrong study type (review, conference abstract etc.)
189. Analyzing the Potential of Advanced Insulin Dosing Strategies in Patients With Type 2 Diabetes: Results From a Hybrid In Silico Study.	Title	Population: do not have T1DM
190. Anorexia nervosa and bulimia in diabetics	Full Text	Population: not children (adults/foetuses)
191. Antiphospholipid syndrome in children	Title	Population: do not have T1DM
192. Anxiety symptoms in adolescents with type 1 diabetes: association with blood glucose monitoring and glycemic control.	Title	Outcome: not related to insulin treatment adherence
193. Análisis discriminante de la adhesión al tratamiento en la diabetes mellitus insulinodependiente	Full Text	Population: not children (adults/foetuses)
194. Aortic compliance measurements using Doppler ultrasound: In vivo biochemical correlates	Title	Population: do not have T1DM

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
195. Application of novel dual wave meal bolus and its impact on glycated hemoglobin A1c level in children with type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
197. Approach to the obese adolescent with new-onset diabetes	Title	Outcome: not related to insulin treatment adherence
199. Are clinical or metabolic variables useful to distinguish between an infant of a diabetic mother and simple macrosomia of the newborn?	Title	Outcome: not related to insulin treatment adherence
200. Are families of children with type 1 DM ready for televisits?	Title	Outcome: not related to insulin treatment adherence
201. Are paediatric patients attending their annual diabetic retinopathy screening?	Title	Outcome: not related to insulin treatment adherence
202. Are we using current up-to-date evidence in the delivery and documentation of sick day management education to children and adolescents with type 1 diabetes?	Title	Outcome: not related to insulin treatment adherence
203. Arterial stiffness as measure of cardiovascular risk in lean and obese adolescents and adolescents with type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
204. Arterial wall thickening and stiffening in children and adolescents with type 1 diabetes.	Title	Outcome: not related to insulin treatment adherence
205. ASPECTS PSYCHOLOGIQUES DE LA COMPLIANCE AU TRAITEMENT CHEZ L'ENFANT DIABETIQUE INSULINODEPENDANTPsychologic aspects of compliance with therapy in children with insulin-dependent diabetes mellitus		
206. Assessing diabetes support in adolescents: factor structure of the Modified Diabetes Social Support Questionnaire (M-DSSQ-Family).	Abstract	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
207. Assessing family sharing of diabetes responsibilities.	Included	
208. Assessing the Impact of Excessive Gestational Weight Gain Among Women With Type 1 Diabetes on Overweight/Obesity in Their Adolescent and Young Adult Offspring: A Pilot Study.	Title	Population: not children (adults/foetuses)
209. Assessing treatment barriers in young adults with type 1 diabetes.	Title	Population: not children (adults/foetuses)
210. Assessment of adherence and healthcare costs of insulin device (FlexPen) versus conventional vial/syringe	Full Text	Population: not children (adults/foetuses)
211. Assessment of patient-reported outcomes of insulin pen devices versus conventional vial and syringe.	Full Text	Wrong study type (review, conference abstract etc.)
213. Assessment of quality of life in children with peanut allergy	Title	Population: do not have T1DM
214. Associated factors with the control of type 1 diabetes mellitus	Abstract	Wrong study type (review, conference abstract etc.)
215. Association between carotid intima-media thickness, buccodental status, and glycemic control in pediatric type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
217. Association between food insecurity and glycemic control among youth with type 1 diabetes in Haiti	Title	Outcome: not related to insulin treatment adherence
218. Association of HbA1c to BOLUS Scores among Youths with Type 1 Diabetes	Abstract	Outcome: not related to insulin treatment adherence
220. Association of insulin-manipulation and psychiatric disorders: A systematic epidemiological evaluation of adolescents with type 1 diabetes in Austria	Included	
221. Associations between family members' perceptions of the health care system and the health of youths with insulin-dependent diabetes mellitus	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
222. Associations between major life events and adherence, glycemic control, and psychosocial characteristics in teens with type 1 diabetes.	Included	
223. Attitudes towards insulin pump therapy among adolescents and young people	Full Text	Population: not children (adults/foetuses)
225. Attributions of teacher reactions to diabetes self-care behaviors	Included	
226. Audit of DKA management in Wellington New Zealand 2005-2013	Title	Outcome: not related to insulin treatment adherence
227. Audit of screening and confirmation of diagnosis of coeliac disease in type 1 diabetes patients	Title	Outcome: not related to insulin treatment adherence
228. Audit of the use of integrated care pathway in the management of diabetic Keto acidosis in children	Title	Outcome: not related to insulin treatment adherence
229. Back to school and normality after lung transplantation in childhood and the need for psycho-social interventions	Title	Population: do not have T1DM
230. Bariatric surgery for severe obesity in two adolescents with type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
232. Barriers to care in the adult patient with cystic fibrosis-related diabetes	Title	Population: not children (adults/foetuses)
233. Barriers to effective management of type 2 diabetes in primary care : qualitative systematic review.	Title	Population: do not have T1DM
234. Barriers to regimen adherence among persons with insulin-dependent diabetes.	Full Text	Population: not children (adults/foetuses)
235. Behavior therapy for families of adolescents with diabetes: Effects on directly observed family interactions	Included	
236. Behavioral Family Systems Therapy for adolescents with diabetes	Abstract	Wrong study type (review, conference abstract etc.)

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
237. Behaviours, thoughts and perceptions around mealtime insulin usage and wastage among people with type 1 and type 2 diabetes mellitus: A cross-sectional survey study.	Abstract	Population: not children (adults/foetuses)
238. Benefits of an insulin dosage calculation device for adolescents with type 1 diabetes mellitus	Included	
240. Benefits of using the I-port system on insulin-treated patients	Included	
241. Beta-cell autoimmunity in pediatric celiac disease: the case for routine screening?	Title	Outcome: not related to insulin treatment adherence
243. Betreuung von Kindern und Jugendlichen mit Diabetes mellitusTreatment of children and adolescents with diabetes mellitus	Full Text	Wrong study type (review, conference abstract etc.)
244. Bias in food intake reporting in children and adolescents with type 1 diabetes: the role of body size, age and gender.	Title	Outcome: not related to insulin treatment adherence
245. Bicentric evaluation of a teaching and treatment programme for type 1 (insulin-dependent) diabetic patients: improvement of metabolic control and other measures of diabetes care for up to 22 months.	Full Text	Population: not children (adults/foetuses)
246. Biomedical predictors of consistent continuous glucose monitoring in youth with type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
247. Biopsychosocial Factors Associated With Satisfaction and Sustained Use of Artificial Pancreas Technology and Its Components: a Call to the Technology Field.	Full Text	Wrong study type (review, conference abstract etc.)
248. Blood glucose control and compliance of diabetic children	Full Text	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
249. Blood glucose monitoring and glycemic control in adolescents with type 1 diabetes: meter downloads versus self-report.	Title	Outcome: not related to insulin treatment adherence
250. Blood glucose monitoring by diabetic adolescents: compliance and metabolic control	Title	Outcome: not related to insulin treatment adherence
251. Blood glucose monitoring: Which is better: Continuous real-time or episodic real-time on demand? CON	Abstract	Outcome: not related to insulin treatment adherence
252. Blood glucose self-monitoring in type 2 diabetes: a randomised controlled trial	Title	Population: do not have T1DM
253. Blood glucose testing by drivers with diabetes: A survey of glucose meter users	Title	Population: not children (adults/foetuses)
254. Blood or urine glucose-based insulin therapy and control of glycemia. Computer-simulation study.	Title	Outcome: not related to insulin treatment adherence
255. Blood pressure lowering for the prevention and treatment of diabetic kidney disease.	Title	Outcome: not related to insulin treatment adherence
256. Body relationship as a predictor of self-care, physical health, and psychological well-being in adolescents with type 1 diabetes	Abstract	Wrong study type (review, conference abstract etc.)
257. Bolus calculator and wirelessly communicated blood glucose measurement effectively reduce hypoglycaemia in type 1 diabetic children - randomized controlled trial.	Abstract	Outcome: not related to insulin treatment adherence
258. Brazilian multicenter study for the evaluation of patients' satisfaction of blood glucose self-monitoring with BGStar blood glucose meter in insulinized patients with diabetes mellitus type 1 and 2	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
259. Brief report: Maternal posttraumatic stress symptoms are related to adherence to their child's diabetes treatment regimen.	Included	
260. Brief report: Parent's health literacy among high-risk adolescents with insulin dependent diabetes	Included	
261. Budget Impact of Long-Acting Insulin Analogues: The Case in Brazil.	Title	Outcome: not related to insulin treatment adherence
262. Burden of Cardiovascular Risk Factors Over Time and Arterial Stiffness in Youth With Type 1 Diabetes Mellitus: The SEARCH for Diabetes in Youth Study.	Title	Outcome: not related to insulin treatment adherence
263. Burden of thiamine deficiency among children presented with diabetic ketoacidosis	Title	Outcome: not related to insulin treatment adherence
264. Can a computer game improve adherence to treatment in children with type 1 diabetes?	Abstract	Wrong study type (review, conference abstract etc.)
265. Can integrated technology improve self-care behavior in youth with type 1 diabetes? A randomized crossover trial of automated pump function.	Abstract	Outcome: not related to insulin treatment adherence
266. Caracteristicas da dieta nas diferentes fases da evolucao do diabetes melito Tipo 1Diet composition along the evolution of Type 1 diabetes mellitus	Title	Outcome: not related to insulin treatment adherence
267. Carbohydrate counting accuracy and blood glucose variability in adults with type 1 diabetes.	Title	Outcome: not related to insulin treatment adherence
268. Carbohydrate counting from onset of diabetes reduced insulin requirements but increased weight in children and adolescents	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
269. Carbohydrate Counting in Children and Adolescents with Type 1 Diabetes.	Title	Outcome: not related to insulin treatment adherence
270. Carbohydrate management	Title	Outcome: not related to insulin treatment adherence
271. Cardiac and Vascular Function in Adolescents and Young Adults with Type 1 Diabetes	Title	Outcome: not related to insulin treatment adherence
273. Cardiometabolic risk in pediatric survivors of childhood cancer	Title	Population: do not have T1DM
274. Cardiometabolic risk in survivors of childhood cancer who received hematopoietic cell transplant (HCT)	Title	Population: do not have T1DM
275. Cardiovascular and metabolic effects of metformin in patients with type 1 diabetes (REMOVAL): a double-blind, randomised, placebo-controlled trial.	Title	Outcome: not related to insulin treatment adherence
276. Cardiovascular disease risk in young people with type 1 diabetes.	Title	Outcome: not related to insulin treatment adherence
278. Care of adolescents and young adults with diabetes - much more than transitional care: a personal view.	Abstract	Population: not children (adults/foetuses)
279. Care of adolescents with type 2 diabetes across the North West London pediatric diabetes network	Title	Population: do not have T1DM
280. Care plans: Part of improving ability to self care	Abstract	Wrong study type (review, conference abstract etc.)
281. Caregiver reports of provider recommended frequency of blood glucose monitoring and actual testing frequency for youth with type 1 diabetes.	Title	Outcome: not related to insulin treatment adherence
282. Case report: Rare form of diabetes mellitus type 1 in adolescent patient	Title	Outcome: not related to insulin treatment adherence
283. Case series of neuropathic symptoms in 3 adolescent females with diabetes mellitus	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
284. Celiac disease arthropathy and autoimmunity study	Title	Population: do not have T1DM
285. Cell Based Therapy for Type 1 Diabetes: Should We Take Hyperglycemia Into Account?	Title	Outcome: not related to insulin treatment adherence
286. Challenges in using insulin pumps in pediatrics : AAA self report by families	Abstract	Wrong study type (review, conference abstract etc.)
287. Challenges of Diabetes Management in Toddlers	Abstract	Outcome: not related to insulin treatment adherence
288. Changes in treatment adherence and glycemic control during the transition to adolescence in type 1 diabetes.	Full Text	Outcome: not related to insulin treatment adherence
289. Changes in type 1 diabetes health indicators from high school to college.	Title	Outcome: not related to insulin treatment adherence
290. Characteristics of adolescents with type 1 diabetes who exhibit adverse outcomes.	Abstract	Outcome: not related to insulin treatment adherence
291. Characteristics of diabetic ketoacidosis in Chinese adults and adolescents -- a teaching hospital-based analysis.	Title	Outcome: not related to insulin treatment adherence
292. Characteristics of pediatric diabetic ketoacidosis patients in Saudi Arabia	Abstract	Outcome: not related to insulin treatment adherence
293. Characterization of metabolic responders on CSII treatment amongst children and adolescents in Denmark from 2007 to 2013	Title	Outcome: not related to insulin treatment adherence
295. Chat line for adolescents with type 1 diabetes: A useful tool to improve coping with diabetes: A 2-year follow-up study	Full Text	Outcome: not related to insulin treatment adherence
297. Children and adolescents living with diabetes and celiac disease.	Abstract	Outcome: not related to insulin treatment adherence
298. Children as partners with adults in their medical care.	Full Text	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
299. Children with coeliac disease and insulin dependent diabetes mellitus - Growth, diabetes control and dietary intake	Abstract	Outcome: not related to insulin treatment adherence
300. Chronic diseases of childhood: Assessing compliance with complex medical regimens	Abstract	Wrong study type (review, conference abstract etc.)
301. Clinical and economic outcomes among patients with diabetes mellitus initiating insulin glargine pen versus vial	Abstract	Population: not children (adults/foetuses)
302. Clinical case: Berardinelli-seip syndrome in a 5 month old child	Title	Outcome: not related to insulin treatment adherence
303. Clinical characteristics and management of patients with type 1 diabetes-a national population-based spanish study (SED1)	Abstract	Population: not children (adults/foetuses)
304. Clinical characteristics of non-insulin-dependent diabetes mellitus among southwestern American Indian youths	Title	Population: do not have T1DM
305. Clinical Efficacy of Two Different Methods to Initiate Sensor-Augmented Insulin Pumps: A Randomized Controlled Trial.	Abstract	Population: not children (adults/foetuses)
306. Clinical practice factors that define insulin pump readiness	Title	Outcome: not related to insulin treatment adherence
307. Clinical predictors of mucormycosis in children with type 1 diabetes mellitus.	Title	Outcome: not related to insulin treatment adherence
308. Clinical profile and outcome of children with diabetic ketoacidosis: Type 1 diabetes mellitus a real challenge for low income Nation	Abstract	Outcome: not related to insulin treatment adherence
309. Clinical profile and outcome of type 1 diabetes mellitus in tertiary care center of Eastern Nepal	Abstract	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
310. Clinical profile and outcomes of paediatric patients with diabetic ketoacidosis at a tertiary care hospital in Pakistan	Abstract	Outcome: not related to insulin treatment adherence
311. Clinical profile of type 1 diabetes mellitus in children referred to a tertiary care centre	Abstract	Outcome: not related to insulin treatment adherence
312. Clinical Use of Continuous Glucose Monitoring in Adults with Type 1 Diabetes.	Title	Population: not children (adults/foetuses)
313. Clinical utility of serologic testing for celiac disease in asymptomatic patients: an evidence-based analysis.	Title	Population: do not have T1DM
314. Clinical, para-clincal and outcomes of diabetes ketoacidosis in Vietnam national hospital pediatrics	Abstract	Outcome: not related to insulin treatment adherence
315. Closing the loop in poor control	Abstract	Outcome: not related to insulin treatment adherence
316. Clustering of coronary heart disease risk factors among obese children	Title	Outcome: not related to insulin treatment adherence
317. Coated pellets with controlled glucose release in treatment of children with diabetes	Title	Outcome: not related to insulin treatment adherence
318. Cognitive and behavioral determinants of compliance in diabetics	Full Text	Population: not children (adults/foetuses)
319. Cognitive-behavioral therapy for the treatment of depression and adherence in patients with type 1 diabetes: pilot data and feasibility.	Full Text	Population: not children (adults/foetuses)
320. Comparing medical utilization between insulin pen and vial users within a pediatric medicaid accountable care organization	Abstract	Wrong study type (review, conference abstract etc.)
321. Comparing social learning and family systems correlates of adaptation in youths with IDDM	Abstract	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
322. Comparison of insulin detemir in a twice daily insulin regimen versus a three times daily insulin regimen in children with type 1 diabetes: A randomized controlled trial	Abstract	Wrong study type (review, conference abstract etc.)
323. Comparison of insulin regimens and administration modalities in pregnancy complicated by diabetes	Title	Population: not children (adults/foetuses)
324. Comparison of medication adherence in diabetes mellitus patients on human versus analogue insulins	Abstract	Population: not children (adults/foetuses)
325. Comparison of quality of life in adolescents with Type 1 diabetes using different treatment modalities; Continuous subcutaneous insulin infusion (insulin pumps), twice daily injections or multiple insulin injections	Abstract	Wrong study type (review, conference abstract etc.)
326. Comparison of usability and patient preference for the new disposable insulin device solostar versus flexpen, lilly disposable pen, and a prototype pen: an open-label study	Included	
327. Compliance and administration methods in management of type 1 diabetes.	Full Text	Wrong study type (review, conference abstract etc.)
329. Compliance bei Kindern und Jugendlichen mit Typ-1-Diabetes (juveniler Diabetes mellitus)Compliance of children and adolescents with type 1 diabetes (juvenile diabetes mellitus)	Full Text	Outcome: not related to insulin treatment adherence
330. Compliance of adolescents with diabetes	Included	
331. Compliance of young diabetics with health regimens	Full Text	Outcome: not related to insulin treatment adherence
332. Compliance to treatment among children with type 1 diabetes mellitus: Experience in Abakaliki	Abstract	Wrong study type (review, conference abstract etc.)

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
333. Compliance with complex medical regimens: Assessing daily management of childhood diabetes	Abstract	Wrong study type (review, conference abstract etc.)
334. Compliance with dietary prescriptions in children and adolescents with insulin-dependent diabetes mellitus	Title	Outcome: not related to insulin treatment adherence
335. Compliance with gluten free diet (GFD) is associated with better glycemic control in children with type 1 diabetes (T1D)	Title	Outcome: not related to insulin treatment adherence
336. Compliance with gluten-free diet has a positive influence on glycemic control in children with celiac disease and type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
337. Comprehensive assessment of long-term therapeutic adherence and recurrent pain in children and adolescents	Full Text	Outcome: not related to insulin treatment adherence
338. Computerized knowledge management in diabetes care	Title	Outcome: not related to insulin treatment adherence
339. Condition-related predictors of successful transition from paediatric to adult care among adolescents with Type 1 diabetes.	Abstract	Outcome: not related to insulin treatment adherence
340. Consequences of delayed pump infusion line change in patients with type 1 diabetes mellitus treated with continuous subcutaneous insulin infusion.	Title	Outcome: not related to insulin treatment adherence
342. Considerations for diabetes: treatment with insulin pen devices.	Full Text	Wrong study type (review, conference abstract etc.)
343. Continuous Glucose Monitoring (CGM) Adherence in Youth with Type 1 Diabetes: Associations with Biomedical and Psychosocial Variables	Title	Outcome: not related to insulin treatment adherence
344. Continuous Glucose Monitoring Adherence: Lessons from a Clinical Trial to Predict Outpatient Behavior	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
346. Continuous glucose monitoring and pumps.	Abstract	Outcome: not related to insulin treatment adherence
347. Continuous glucose monitoring interventions in toddlers with type 1 diabetes (T1D)	Abstract	Outcome: not related to insulin treatment adherence
348. Continuous glucose monitoring systems for type 1 diabetes mellitus.	Abstract	Outcome: not related to insulin treatment adherence
350. Continuous Glucose Monitoring vs Conventional Therapy for Glycemic Control in Adults With Type 1 Diabetes Treated With Multiple Daily Insulin Injections: The GOLD Randomized Clinical Trial.	Title	Population: not children (adults/foetuses)
351. Continuous subcutaneous insulin infusion ("Insulin Pump") in pediatric patients with type 1 diabetes: Experience in a Chilean state hospital	Abstract	Outcome: not related to insulin treatment adherence
352. Continuous subcutaneous insulin infusion (CSII)	Full Text	Wrong study type (review, conference abstract etc.)
353. Continuous subcutaneous insulin infusion (insulin pump) therapy can be safely used in the hospital in select patients.	Full Text	Population: not children (adults/foetuses)
354. Continuous subcutaneous insulin infusion in Italy: third national survey.	Abstract	Outcome: not related to insulin treatment adherence
355. Control of type 2 diabetes mellitus among general practitioners in private practice in nine countries of Latin America	Title	Population: do not have T1DM
356. Coping styles in youths with insulin-dependent diabetes mellitus	Included	
357. Correlates of insulin injection omission.	Abstract	Population: not children (adults/foetuses)
358. Correlates of medication adherence in the TODAY cohort of youth with type 2 diabetes	Title	Population: do not have T1DM
359. Costs associated with long-acting insulin analogues in patients with diabetes.	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
360. Could clinical parameters at initiation of continuous glucose monitoring (CGM) predict efficacy on HbA1c in type 1 diabetes (T1D) pediatric patients at 3 months? Preliminary results in a prospective study of 141 patients (Start-In!)	Title	Outcome: not related to insulin treatment adherence
361. CoYoT1 Clinic: Home Telemedicine Increases Young Adult Engagement in Diabetes Care.	Title	Population: not children (adults/foetuses)
362. Crisis intervention program in newly diagnosed diabetic children.	Included	
363. Cross-cultural adaption and psychometric properties of the Chinese version of the Diabetes Behavior Rating Scale: a pilot study	Abstract	Outcome: not related to insulin treatment adherence
364. Current Diagnosis and Treatment, and Clinical Challenges in the Management of Lipodystrophy Syndromes in Children and Youth	Abstract	Population: do not have T1DM
365. Cyclical cushing's disease in an adolescent with type I diabetes	Title	Outcome: not related to insulin treatment adherence
366. Cytoadherence of lymphocytes from type I diabetic subjects to insulin-secreting cells. Marker of anti-beta-cell cellular immunity.	Title	Outcome: not related to insulin treatment adherence
367. D-buddy peer support for better health outcomes in adolescents with diabetes mellitus	Abstract	Outcome: not related to insulin treatment adherence
368. Daily insulin requirement of children and adolescents with type 1 diabetes: Effect of age, gender, body mass index and mode of therapy	Title	Outcome: not related to insulin treatment adherence
370. Das diabetische kind auf der notfallstationThe diabetic child and adolescent in the emergency room	Abstract	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
371. Day-to-day consistency in amount and source of carbohydrate intake associated with improved blood glucose control in type 1 diabetes.	Title	Outcome: not related to insulin treatment adherence
373. Decision-making in diabetes mellitus type 1.	Full Text	Wrong study type (review, conference abstract etc.)
374. Defective erythrocyte C3b receptor function associated with low serum complement (C3, C4) concentrations in insulin-dependent diabetes mellitus.	Title	Outcome: not related to insulin treatment adherence
375. Depression among adults with diabetes in Jordan: risk factors and relationship to blood sugar control.	Title	Population: not children (adults/foetuses)
376. Depression and suicidal ideation in adolescents with type 1 diabetes mellitus	Abstract	Outcome: not related to insulin treatment adherence
377. Depression-related hyperglycemia in type 1 diabetes: a mediational approach.	Full Text	Population: not children (adults/foetuses)
378. Depressive symptoms and glycemic control in adolescents with type 1 diabetes: mediational role of blood glucose monitoring.	Abstract	Outcome: not related to insulin treatment adherence
379. Depressive symptoms in type 1 diabetic children with poor and excellent metabolic control	Abstract	Outcome: not related to insulin treatment adherence
380. Depressive symptoms, daily stress, and adherence in late adolescents with type 1 diabetes.	Included	
381. Depressive symptoms, depression-related cognitions, and diabetes care in adolescence	Abstract	Wrong study type (review, conference abstract etc.)
382. Design, construction, and implementation of an online platform for patients with type 1 diabetes: EncoDiab.	Abstract	Population: not children (adults/foetuses)

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
383. Detecting intentional insulin omission for weight loss in girls with type 1 diabetes mellitus.	Included	
384. Determinacion continua de glucosa sistema glucoday. En ninos adolescentes con diabetes tipo 1[Continuous glucose monitoring using the Glucoday system, in children and adolescents who have type one diabetes]	Abstract	Outcome: not related to insulin treatment adherence
385. Determinants of Glycemic Control among Insulin Treated Diabetic Patients in Southwest Ethiopia: Hospital Based Cross Sectional Study	Title	Outcome: not related to insulin treatment adherence
386. Determinants of outcome of children with type 1 diabetes in Cameroon	Title	Outcome: not related to insulin treatment adherence
387. Determinants of self-monitoring of blood glucose in patients with Type 1 diabetes: a multi-centre study in Brazil.	Title	Outcome: not related to insulin treatment adherence
388. Developing a theoretical maintenance model for disordered eating in Type 1 diabetes.	Title	Outcome: not related to insulin treatment adherence
389. Development and evaluation by a cluster randomised trial of a psychosocial intervention in children and teenagers experiencing diabetes: The DEPICTED study	Included	
391. Development and validity testing of the revised diabetes self-care inventory for children and adolescents	Included	
392. Development of a New Measure for Assessing Insulin Delivery Device Satisfaction in Patients with Type 1 and Type 2 Diabetes.	Abstract	Population: not children (adults/foetuses)
393. Development of an Insulin-Prescribing Chart for Paediatric Diabetes	Abstract	Outcome: not related to insulin treatment adherence
394. Developmental effects of type 1 diabetes	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
395. Developmental influences on adolescent health	Title	Population: do not have T1DM
396. Dextran-b-poly(lactide-co-glycolide) polymersome for oral delivery of insulin: In vitro and in vivo evaluation.	Title	Outcome: not related to insulin treatment adherence
397. Diabeetikkonuoren hoitoon sitoutuminen ja perheen toimivuus nuoren itsensa arvioimanaCompliance of young diabetic patients with therapeutic regimens and participation by the family	Full Text	Outcome: not related to insulin treatment adherence
398. DIABEO App Software and Telemedicine Versus Usual Follow-Up in the Treatment of Diabetic Patients: Protocol for the TELESAGE Randomized Controlled Trial.	Abstract	Outcome: not related to insulin treatment adherence
399. Diabete di tipo 1 in eta pediatrica all'esordio: Casistica ospedaliera Italiana raccolta mediante networkChildhood type 1 diabetes at onset: Network for collection of case records in Italian hospitals	Title	Outcome: not related to insulin treatment adherence
400. Diabetes Control and Adherence in Adolescence.	Full Text	Wrong study type (review, conference abstract etc.)
401. Diabetes Control and Complications Trial (DCCT): results of feasibility study. The DCCT Research Group.	Title	Outcome: not related to insulin treatment adherence
402. Diabetes control did not worsen after insulin pump discontinuation in non-compliant adolescents with type 1 diabetes	Abstract	Outcome: not related to insulin treatment adherence
403. Diabetes in childhood	Abstract	Wrong study type (review, conference abstract etc.)
404. Diabetes in Japan: a review of disease burden and approaches to treatment.	Title	Outcome: not related to insulin treatment adherence
405. Diabetes knowledge in preadolescents with type 1 diabetes	Abstract	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
406. Diabetes melito do tipo 2 na infancia e adolescencia: Revisao da literaturaType 2 diabetes in children and adolescents: Literature review	Title	Population: do not have T1DM
407. Diabetes mellitus as a model of psychosomatic and somatopsychic interrelationships.	Title	Outcome: not related to insulin treatment adherence
408. Diabetes mellitus at a rural hospital in northwestern Tanzania	Abstract	Outcome: not related to insulin treatment adherence
409. Diabetes mellitus in the transition to adulthood: adjustment, self-care, and health status	Abstract	Population: not children (adults/foetuses)
410. Diabetes mellitus type 1 in patient with medium-chain acyl-coenzyme a dehydrogenase deficiency	Abstract	Outcome: not related to insulin treatment adherence
411. Diabetes mellitus.	Abstract	Outcome: not related to insulin treatment adherence
412. Diabetes regimen behaviors. Predicting adherence	Full Text	Population: not children (adults/foetuses)
413. Diabetes resilience: Psychometric properties of a measure for preadolescents with type 1 diabetes	Abstract	Outcome: not related to insulin treatment adherence
414. Diabetes technology and the human factor.	Abstract	Wrong study type (review, conference abstract etc.)
415. Diabetes technology in adolescents and young adults	Abstract	Wrong study type (review, conference abstract etc.)
416. Diabetes-specific risk taking-psychometric properties of a measure for adolescents with type 1 diabetes (T1D)	Abstract	Wrong study type (review, conference abstract etc.)
417. Diabetic care provision and glycemic control in a pediatrics diabetic clinic: An audit	Abstract	Outcome: not related to insulin treatment adherence
418. Diabetic control in adolescents	Abstract	Population: not children (adults/foetuses)
419. Diabetic ketoacidosis complicating pregnancy.	Title	Population: not children (adults/foetuses)
420. Diabetic ketoacidosis in a patient with islet cell transplant	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
421. Diabetic ketoacidosis in an adolescent and young adult population in the UK in 2014: National survey comparison of the management in adult and paediatric settings	Title	Outcome: not related to insulin treatment adherence
422. Diabetic ketoacidosis in the setting of HNF1A-maturity onset diabetes of the young.	Title	Outcome: not related to insulin treatment adherence
423. Diabetic ketoacidosis with acute renal failure and rhabdomyolsis: A case presentation and review of literate	Title	Outcome: not related to insulin treatment adherence
424. Diabetic ketoacidosis, determinants and mortality rate in Sudanese children with type 1 diabetes mellitus	Title	Outcome: not related to insulin treatment adherence
425. Diabetic ketoacidosis--a study of 33 episodes	Title	Outcome: not related to insulin treatment adherence
426. Diabetic ketoacidosis: risk factors and management strategies.	Title	Outcome: not related to insulin treatment adherence
427. Diabetic mellitus type 1 in patient with beta major thalassemia (case report)	Title	Outcome: not related to insulin treatment adherence
428. Diabulimia: how eating disorders can affect adolescents with diabetes	Full Text	Wrong study type (review, conference abstract etc.)
430. Diagnosis and management of hyperglycemic emergencies.	Title	Outcome: not related to insulin treatment adherence
431. Diagnosis and management of type 2 diabetes in youth in North Queensland and the Northern Territory: A health professional survey	Title	Population: do not have T1DM
432. Diazoxide in children with obesity after hypothalamic-pituitary lesions: A randomized, placebo-controlled trial	Title	Population: do not have T1DM
433. Diet and the diabetic patient.	Title	Outcome: not related to insulin treatment adherence
434. Diet therapy among young diabetics in the Philippines.	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
435. Diet-related knowledge, skill, and adherence among children with insulin-dependent diabetes mellitus	Title	Outcome: not related to insulin treatment adherence
436. Dietary adherence and associated glycemic control in families of young children with type 1 diabetes.	Title	Outcome: not related to insulin treatment adherence
437. Dietary Adherence and Mealtime Behaviors in Young Children with Type 1 Diabetes on Intensive Insulin Therapy	Title	Outcome: not related to insulin treatment adherence
439. Dietary behaviors predict glycemic control in youth with type 1 diabetes.	Title	Outcome: not related to insulin treatment adherence
440. Dietary compliance among insulin-dependent diabetics.	Title	Outcome: not related to insulin treatment adherence
441. Dietary intake and risk of non-severe hypoglycemia in adolescents with type 1 diabetes.	Title	Outcome: not related to insulin treatment adherence
442. Dietary survey of diabetics	Title	Outcome: not related to insulin treatment adherence
443. Differences between bulimia nervosa and binge-eating disorder in females with type 1 diabetes: the important role of insulin omission.	Full Text	Population: not children (adults/foetuses)
444. Differences in family mealtime interactions between young children with type 1 diabetes and controls: implications for behavioral intervention.	Abstract	Outcome: not related to insulin treatment adherence
445. Differences in long-term metabolic control and BMI in children with type 1 diabetes on insulin pumps stratified by age and sex	Title	Outcome: not related to insulin treatment adherence
446. Differences in the metabolism of postprandial lipoproteins after a high-monounsaturated-fat versus a high-carbohydrate diet in patients with type 1 diabetes mellitus.	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
447. Different health behaviours and clinical factors associated with bone mineral density and bone turnover in premenopausal women with and without type 1 diabetes.	Title	Outcome: not related to insulin treatment adherence
448. Dificultades y preocupaciones identificadas por jovenes puertorriquenos/as con diabetes mellitus insulino-dependiente (IDDM): su relacion con control metabolico, desesperanza, apoyo social y sintomatologia depresivaDifficulties and concerns identified by Puerto Rican youth with insulin-dependent diabetes mellitus (IDDM): their relationship with metabolic control, hopelessness, social support, and depressive symptoms	Included	
449. Discontinuation of insulin pump treatment in children, adolescents, and young adults. A multicenter analysis based on the DPV database in Germany and Austria.	Title	Outcome: not related to insulin treatment adherence
450. Discordant diabetes family responsibility sharing is associated with increased diabetes family conflict in youth with type 1 diabetes (T1D)	Abstract	Wrong study type (review, conference abstract etc.)
451. Discriminacion de niveles de glucosa en sangre en diabeticos insulino-dependientes mediante señales externas y perfiles glucemicos	Abstract	Outcome: not related to insulin treatment adherence
452. Discriminant analysis of treatment adherence in insulin-dependent diabetes mellitus	Full Text	Population: not children (adults/foetuses)
453. Disease burden in young adults with Type 2 diabetes: A retrospective study	Title	Population: not children (adults/foetuses)

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
454. Disease management in the young diabetic patient: glucose monitoring, coping skills, and treatment strategies.	Abstract	Outcome: not related to insulin treatment adherence
455. Disease management programs for patients with type 2 diabetes mellitus in Germany: a longitudinal population-based descriptive study	Title	Population: do not have T1DM
456. Dismissing attachment and outcome in diabetes: The mediating role of coping	Full Text	Population: not children (adults/foetuses)
457. Disordered Eating Behaviors Are Not Increased by an Intervention to Improve Diet Quality but Are Associated With Poorer Glycemic Control Among Youth With Type 1 Diabetes.	Abstract	Outcome: not related to insulin treatment adherence
458. Disposable insulin syringe reuse and aseptic practices in diabetic patients	Title	Outcome: not related to insulin treatment adherence
459. DKA management and outcomes	Title	Outcome: not related to insulin treatment adherence
460. Do European people with type 1 diabetes consume a high atherogenic diet? 7-year follow-up of the EURODIAB Prospective Complications Study.	Title	Outcome: not related to insulin treatment adherence
461. Do fat and protein need insulin? The complex food counting in meal-bolus calculation	Title	Outcome: not related to insulin treatment adherence
462. Do youth with type 1 diabetes exercise safely? A focus on patient practices and glycemic outcomes.	Abstract	Outcome: not related to insulin treatment adherence
463. Does high blood glucose mean more insulin? Type 1 diabetes management in children and adolescents	Title	Outcome: not related to insulin treatment adherence
465. Does parental perception of their child's quality of life and diabetes knowledge matter in relation to improving glycaemic control?	Abstract	Wrong study type (review, conference abstract etc.)

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
466. Does patient behavior or access factors have the largest influence on screening in type 1 diabetes?	Title	Outcome: not related to insulin treatment adherence
467. Does self-efficacy mediate the cross-sectional relationship between perceived quality of health care and self-management of diabetes? Results from Diabetes MILES - Australia.	Abstract	Population: not children (adults/foetuses)
468. Durability of insulin pump use in pediatric patients with type 1 diabetes	Full Text	Outcome: not related to insulin treatment adherence
470. Dynamic regulation of plasma matrix metalloproteinases in human diabetic ketoacidosis	Title	Outcome: not related to insulin treatment adherence
472. Early age at menarche: a risk factor for overweight or obesity in patients with type 1 diabetes living in urban areas?	Title	Outcome: not related to insulin treatment adherence
473. Early diabetic nephropathy in a pediatric renal transplant recipient leading to end stage renal disease	Title	Outcome: not related to insulin treatment adherence
474. Early feeding and risk of type 1 diabetes: Experiences from the Trial to Reduce Insulin-dependent diabetes mellitus in the Genetically at Risk (TRIGR)	Title	Outcome: not related to insulin treatment adherence
476. Early identification of monogenic diabetes: Implications on medical treatment and genetic counselling for an adolescent girl with MODY3	Title	Population: do not have T1DM
477. Early infant feeding and risk of developing type 1 diabetes associated autoantibodies	Title	Outcome: not related to insulin treatment adherence
479. Early onset type 2 diabetes mellitus in a Saudi child misdiagnosed as type 1 diabetic: A case report.	Title	Population: do not have T1DM

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
480. Early pharmacokinetic and pharmacodynamic effects of mixing lispro with glargine insulin: Results of glucose clamp studies in youth with type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
482. Early presentation of type 2 diabetes in Mexican-American youth	Title	Population: do not have T1DM
484. Early risk factors for nonadherence in pediatric type 1 diabetes: a review of the recent literature.	Title	Wrong study type (review, conference abstract etc.)
486. Early signs of atherosclerosis in diabetic children on intensive insulin treatment: A population-based study	Title	Outcome: not related to insulin treatment adherence
488. Eating disorders in adolescents with type 1 and type 2 diabetes mellitus: Prevelance and adherence to the regimen	Abstract	Wrong study type (review, conference abstract etc.)
489. Eating habits, body weight, and insulin misuse. A longitudinal study of teenagers and young adults with type 1 diabetes.	Abstract	Population: not children (adults/foetuses)
490. Eating patterns in adolescents with type 1 diabetes: Associations with metabolic control, insulin omission, and eating disorder pathology.	Included	
491. Education and care in schooled diabetic children and adolescents	Abstract	Wrong study type (review, conference abstract etc.)
493. Educational program for patients with type-1 diabetes mellitus receiving free monthly supplies of insulin improves knowledge and attitude, but not adherence.	Abstract	Outcome: not related to insulin treatment adherence
494. Educational social games embedded in a telemonitoring tool for children with type 1 diabetes: A preliminary paper	Abstract	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
495. Educational strategies on insulin therapy for young people with diabetes mellitus: Systematic review	Abstract	Outcome: not related to insulin treatment adherence
496. Effect of dietary compliance on metabolic control in insulin-dependent diabetics	Title	Outcome: not related to insulin treatment adherence
497. Effect of fasting during Ramadan on different metabolic parameters and quality of life in type 1 diabetic patients	Title	Outcome: not related to insulin treatment adherence
498. Effect of gluten-free diet and adherence on growth and diabetic control in diabetics with coeliac disease	Title	Outcome: not related to insulin treatment adherence
500. Effect of health beliefs among physicians, families, and children with insulin-dependent diabetes mellitus on treatment adherence and metabolic control	Abstract	Wrong study type (review, conference abstract etc.)
501. Effect of metformin on vascular function in children with type 1 diabetes: A 12-month randomized controlled trial	Title	Outcome: not related to insulin treatment adherence
502. Effect of therapy with insulin glargine (lantus) on glycemic control in toddlers, children, and adolescents with diabetes.	Title	Outcome: not related to insulin treatment adherence
503. Effectiveness of a tailored medical support to overcome the barriers to education, treatment and good metabolic control in children with type-1 diabetes from ethnic minorities.	Abstract	Outcome: not related to insulin treatment adherence
504. Effectiveness of lactobacillus reuteri oral administration on periodontal disease in children and adolescents with type 1 diabetes	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
505. Effectiveness of multiple daily injection or continuous infusion of insulin on children at different courses of T1DM	Abstract	Wrong study type (review, conference abstract etc.)
506. Effectiveness of sensor-augmented pump therapy in children and adolescents with type 1 diabetes in the STAR 3 study.	Abstract	Outcome: not related to insulin treatment adherence
507. Effectiveness of the sensor augmented pump in managing type i diabetes mellitus	Abstract	Wrong study type (review, conference abstract etc.)
508. Effects of a behavioral intervention on treatment adherence and stress management in adolescents with IDDM	Included	
509. Effects of cognitive behavioural group training (CBGT) in adult patients with poorly controlled insulin-dependent (type 1) diabetes: a pilot study.	Title	Population: not children (adults/foetuses)
510. Effects of diabetes em movimento community-based exercise program on body composition in patients with type 2 diabetes	Title	Population: do not have T1DM
511. Effects of enhanced conventional therapy on metabolic control in children with insulin-dependent diabetes mellitus	Title	Outcome: not related to insulin treatment adherence
512. Effects of Lactobacillus rhamnosus GG and Bifidobacterium lactis Bb12 on beta-cell function in children with newly diagnosed type 1 diabetes: A pilot study	Title	Outcome: not related to insulin treatment adherence
513. Efficacy and safety of insulin degludec in a flexible dosing regimen vs insulin glargine in patients with type 1 diabetes (BEGIN: Flex T1): a 26-week randomized, treat-to-target trial with a 26-week extension.	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
514. Efficacy and safety of the glucagon-like peptide-1 receptor agonist liraglutide added to insulin therapy in poorly regulated patients with type 1 diabetes--a protocol for a randomised, double-blind, placebo-controlled study: the Lira-1 study.	Title	Outcome: not related to insulin treatment adherence
516. Efficacy of Humalog injections before an afternoon meal and their acceptance by children and adolescents with Type 1 diabetes	Full Text	Outcome: not related to insulin treatment adherence
518. Efficacy of Metformin Treatment with Respect to Weight Reduction in Children and Adults with Obesity: A Systematic Review	Title	Population: do not have T1DM
519. Efficacy of sensor-augmented insulin pump with predictive low glucose suspension: A multicentre clinical experience in adults and children in Spain	Abstract	Outcome: not related to insulin treatment adherence
520. Efficacy of Thrice-daily versus Twice-daily Insulin Regimens on Glycohemoglobin (Hb A1c) in Type 1 Diabetes Mellitus: A Randomized Controlled Trial.	Abstract	Outcome: not related to insulin treatment adherence
521. Efficacy without barriers to insulin therapy: lessons from the BEGIN trial programme.	Full Text	Population: not children (adults/foetuses)
522. Efficacy, safety and acceptability of the new pen needle 33G?×?4?mm. AGO 01 study.	Title	Outcome: not related to insulin treatment adherence
523. Efficacy, safety and acceptability of the new pen needle 34G?×?3.5?mm: a crossover randomized non-inferiority trial; AGO 02 study.	Title	Outcome: not related to insulin treatment adherence
524. El cuidado de la diabetes mellitus insulino-dependiente: Efectos de un programa de modificación de conducta en padres	Included	

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
525. Elimination of dietary gluten does not reduce titers of type 1 diabetes-associated autoantibodies in high-risk subjects.	Title	Outcome: not related to insulin treatment adherence
526. Emotions and compliance in diabetic children	Full Text	Wrong study type (review, conference abstract etc.)
527. Empirical validation for a family-centered model of care	Included	
528. Endothelial cell-binding properties of lymphocytes infiltrated into human diabetic pancreas: Implications for pathogenesis of IDDM	Title	Outcome: not related to insulin treatment adherence
529. Endurance athletes and type 1 diabetes.	Title	Outcome: not related to insulin treatment adherence
530. Engagement with a Text-Messaging Intervention Improves Adherence in Adolescents with Type 1 Diabetes: Brief Report.	Included	
531. Engaging hispanic adolescents with type 2 diabetes or obesity in personalized exercise	Title	Population: do not have T1DM
532. Entred-Ado study: Health, education and risk behaviours of adolescents with diabetes	Abstract	Outcome: not related to insulin treatment adherence
533. Environmental factors affecting management of type 1 diabetes in children below the age of 10.	Included	
534. Epidemiology and chelation therapy effects on glucose homeostasis in thalassaemic patients	Title	Population: do not have T1DM
535. Establishing a baseline for patients with type 1 diabetes who wear medical identification	Title	Outcome: not related to insulin treatment adherence
536. Estimation of secondary effect parameters in glycaemic dynamics using accumulating data from a virtual type 1 diabetic patient.	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
537. Evaluacion de un programa de atencion al diabetico. Estudio de continuidad a 40 mesesEvaluation of a program for the care of the diabetic. A 40-month continuity study	Title	Outcome: not related to insulin treatment adherence
538. Evaluating the carbohydrate counting method related to blood glucose monitoring habits in type 1 diabetes mellitus patients	Title	Outcome: not related to insulin treatment adherence
539. Evaluating the impact of an insulin pump discontinuation action plan on patient or caregiver confidence and anxiety	Abstract	Outcome: not related to insulin treatment adherence
540. Evaluation of left ventricular diastolic function in insulin dependent diabetic children by M-mode and Doppler echocardiography	Title	Outcome: not related to insulin treatment adherence
542. Evaluation of the Adherence to Continuous Glucose Monitoring in the Management of Type 1 Diabetes Patients on Sensor-Augmented Pump Therapy: The SENLOCOR Study.	Title	Outcome: not related to insulin treatment adherence
544. Evaluation of the Carbohydrate, Insulin Collaborative Education (CHOICE) programme for young people with Type 1 diabetes	Abstract	Outcome: not related to insulin treatment adherence
545. Evaluation of the efficacy and tolerability of acarbose in patients with diabetes mellitus : a postmarketing surveillance study.	Title	Outcome: not related to insulin treatment adherence
546. Evaluation of the juniorSTAR half-unit insulin pen in young people with type 1 diabetes - user perspectives	Included	

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
548. Evaluation of the knowledge and skills on self-monitoring blood glucose in patients and caregivers of patients with diabetes mellitus type 1	Title	Outcome: not related to insulin treatment adherence
549. Evaluation of the treatment of diabetic ketoacidosis in the medical intensive care unit	Title	Outcome: not related to insulin treatment adherence
550. Evaluation of treatment adherence in type 1 diabetes: A novel approach	Abstract	Outcome: not related to insulin treatment adherence
552. Evidence for early stage atherosclerosis and low grade inflammation in diabetic children on intensive insulin treatment: A population based study	Title	Outcome: not related to insulin treatment adherence
553. Evolution of the diabetic diet: Fats and fallacies.	Title	Outcome: not related to insulin treatment adherence
554. Examining concurrent validity of the mealtime BOLUS score with common psychosocial correlates of adherence in youth	Abstract	Wrong study type (review, conference abstract etc.)
555. Executive functioning, parenting stress, and family factors as predictors of diabetes management in pediatric patients with type 1 diabetes using intensive regimens	Included	
556. Exercise capacity in healthy pubertal children in comparison with type 1 diabetic pubertal children	Title	Outcome: not related to insulin treatment adherence
557. Exercise equipment and diabetes.	Title	Outcome: not related to insulin treatment adherence
558. Exercise therapy: prevention and treatment of disease	Title	Outcome: not related to insulin treatment adherence
559. Exercise to preserve beta cell function in recent-onset type 1 diabetes mellitus (EXTOD)--a study protocol for a pilot randomized controlled trial.	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
560. Exercise to preserve ß-cell function in recent-onset Type 1 diabetes mellitus (EXTOD) - a randomized controlled pilot trial.	Title	Outcome: not related to insulin treatment adherence
561. Exercise training and glycemic control in adolescents with poorly controlled type 1 diabetes mellitus.	Title	Outcome: not related to insulin treatment adherence
562. Experience with the Enlite sensor in a multicenter pediatric study.	Title	Outcome: not related to insulin treatment adherence
563. Experiences and real life management of insulin pump therapy in adults with type 1 diabetes.	Title	Population: not children (adults/foetuses)
564. Experiences in diabetes management: Interviews with children with type 2 diabetes and their caregivers	Title	Population: do not have T1DM
565. Experimental cannabidiol treatment reduces early pancreatic inflammation in type 1 diabetes.	Title	Outcome: not related to insulin treatment adherence
566. Expert Study: Utility of an Automated Bolus Advisor System in Patients with Type 1 Diabetes Treated with Multiple Daily Injections of Insulin-A Crossover Study.	Full Text	Population: not children (adults/foetuses)
567. Explanatory style in parents and insulin-dependent diabetic children in relation to depressive symptoms, compliance and metabolic control	Abstract	Wrong study type (review, conference abstract etc.)
568. Exploring factors influencing HbA1c and psychosocial outcomes in people with type 1 diabetes after training in advanced carbohydrate counting.	Full Text	Population: not children (adults/foetuses)
569. Exploring the motivations behind misreporting self-measured blood glucose in adolescents with type 1 diabetes - a qualitative study	Abstract	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
571. Expressed emotion and warmth: Extending the EE contrast to insulin-dependent diabetes mellitus	Full Text	Outcome: not related to insulin treatment adherence
572. Extremely elevated triglyceride blood concentration as a presentation of type 2 diabetes mellitus (T2DM) in childhood obesity	Title	Population: do not have T1DM
573. Exubera(®) (inhaled insulin): an evidence-based review of its effectiveness in the management of diabetes.	Title	Outcome: not related to insulin treatment adherence
574. Facteurs lies a l'evolution des connaissances du diabete de l'enfance a l'adolescenceFactors associated with change in diabetes knowledge from childhood to adolescence	Abstract	Outcome: not related to insulin treatment adherence
575. Factitious self-manipulation of the external insulin pump in adolescents with Type 1 diabetes.	Full Text	Wrong study type (review, conference abstract etc.)
576. Factores Psicológicos y Sociales Asociados a la Adherencia al Tratamiento en Adolescentes Diabéticos Tipo 1		
577. Factors associated to adherence to blood glucose self-monitoring in patients with diabetes treated with insulin. The dapa study.	Title	Outcome: not related to insulin treatment adherence
578. Factors associated with adherence to continuous subcutaneous insulin infusion in pediatric diabetes	Abstract	Outcome: not related to insulin treatment adherence
580. Factors associated with adherence to diabetes care recommendations among children and adolescents with type 1 diabetes: A facility-based study in two urban diabetes clinics in Uganda		

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
581. Factors associated with glycemic control in children and adolescents with type 1 diabetes mellitus at a tertiary-care center in Thailand: A retrospective observational study	Title	Outcome: not related to insulin treatment adherence
584. Factors associated with glycemic control: A cross-sectional nationwide study in 2,579 french children with type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
585. Factors associated with having eye examinations in persons with diabetes	Title	Outcome: not related to insulin treatment adherence
586. Factors associated with high levels of glycated haemoglobin in patients with type 1 diabetes: a multicentre study in Brazil.	Title	Outcome: not related to insulin treatment adherence
587. Factors associated with increased risk of insulin pump discontinuation in pediatric patients with type 1 diabetes.	Full Text	Outcome: not related to insulin treatment adherence
588. Factors associated with non-adherence to insulin in patients with type 1 diabetes.	Full Text	Population: not children (adults/foetuses)
590. Factors associated with shared decision-making in pediatric type 1 diabetes: The search for diabetes in youth study	Title	Outcome: not related to insulin treatment adherence
591. Factors influencing the quality of glycemic control in children and adolescents with type 1 diabetes, after five years of full and equal access of self-monitoring supplies	Title	Outcome: not related to insulin treatment adherence
592. Factors related to CSII compliance	Full Text	Population: not children (adults/foetuses)
593. Failure to achieve target glycaemic control on continuous subcutaneous insulin infusion (CSII) - Is passive pumping to blame?	Abstract	Wrong study type (review, conference abstract etc.)
594. Familial idiopathic oedema in prepubertal children: A new syndrome	Title	Population: do not have T1DM

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
595. Family and disease management in young type 1 diabetic patients.	Abstract	Outcome: not related to insulin treatment adherence
596. Family conflict, adherence, and glycaemic control in youth with short duration Type 1 diabetes.	Abstract	Outcome: not related to insulin treatment adherence
597. Family factors involved in insulin-dependent diabetes mellitus: Metabolic control and compliance	Abstract	Wrong study type (review, conference abstract etc.)
598. Family physicians' and general practitioners' approaches to drug management of diabetic hypertension in primary care	Title	Outcome: not related to insulin treatment adherence
599. Family-based behavior therapy for diabetic adolescents	Abstract	Wrong study type (review, conference abstract etc.)
600. Faster pharmacokinetics and increased patient acceptance of intradermal insulin delivery using a single hollow microneedle in children and adolescents with type 1 diabetes	Included	
602. Father-absent adolescents with insulin-dependent diabetes mellitus: A population at risk?	Included	
603. Fatores associados a auto-aplicacao da insulina nos usuarios com diabetes mellitus acompanhados pela Estrategia Saude da FamiliaFactors associated with insulin self-administration by diabetes mellitus patients in the Family Health Strategy	Full Text	Population: not children (adults/foetuses)
604. Fear of driving license withdrawal in patients with insulin-treated diabetes mellitus negatively influences their decision to report severe hypoglycemic events to physicians.	Abstract	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
605. Fear of hypoglycemia in adults with type 1 diabetes: impact of therapeutic advances and strategies for prevention - a review.	Title	Population: not children (adults/foetuses)
606. Fear of hypoglycemia in type 1 diabetes managed by continuous subcutaneous insulin infusion: is it associated with poor glycemic control?	Full Text	Population: not children (adults/foetuses)
607. Feasibility of a mobile phone-based data service for functional insulin treatment of type 1 diabetes mellitus patients.	Abstract	Population: not children (adults/foetuses)
608. Feasibility of an online intervention (STAK-D) to promote physical activity in children with type 1 diabetes: Protocol for a randomised controlled trial	Title	Outcome: not related to insulin treatment adherence
609. Feasibility of genetic and immunological prediction of Type I diabetes in a population-based birth cohort	Title	Outcome: not related to insulin treatment adherence
610. First 20 months' experience with use of mefformin for type 2 diabetes in a large health maintenance organization	Title	Population: do not have T1DM
611. Flexible insulin dosing improves health-related quality-of-life (HRQoL): a time trade-off survey.	Full Text	Population: not children (adults/foetuses)
613. Frequency and motives of blood glucose self-monitoring in type 1 diabetes.	Title	Outcome: not related to insulin treatment adherence
614. Frequency and reasons for CSII discontinuation in children and young patients with T1DM	Abstract	Wrong study type (review, conference abstract etc.)
615. Frequency of blood glucose monitoring in relation to glycaemic control: observational study with diabetes database.	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
616. Frequency of blood glucose testing in well educated patients with diabetes mellitus type 1: how often is enough?	Title	Outcome: not related to insulin treatment adherence
617. Frequency of diabetic keto-acidosis in children with cystic fibrosis related diabetes	Title	Population: do not have T1DM
618. Frequency of mealtime insulin bolus as a proxy measure of adherence for children and youths with type 1 diabetes mellitus	Abstract	Outcome: not related to insulin treatment adherence
620. Frequency of mealtime insulin bolus predicts glycated hemoglobin in youths with type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
622. Frequency of Missed Insulin Boluses in Type 1 Diabetes and Its Impact on Diabetes Control.	Title	Outcome: not related to insulin treatment adherence
623. Function of the growth hormone-insulin-like growth factor I axis in the profoundly growth-retarded diabetic child: Evidence for defective target organ responsiveness in the mauriac syndrome	Title	Outcome: not related to insulin treatment adherence
624. Functional and psychosocial ramifications of type 1 diabetes mellitus in pediatric endocrinology	Abstract	Wrong study type (review, conference abstract etc.)
625. Fungal esophagitis in a child with insulin diabetes dependent mellitus	Title	Outcome: not related to insulin treatment adherence
626. Further examination of a structured adherence interview of diabetes for children, adolescents, and parents	Abstract	Outcome: not related to insulin treatment adherence
627. Generic and disease-specific quality of life in adolescents with type 1 diabetes: comparison to age-matched healthy peers.	Abstract	Outcome: not related to insulin treatment adherence
628. Gluten-free diet in children with recent-onset type 1 diabetes without coeliac disease: A 12-month intervention trial	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
629. Gluten-free diet in newly diagnosed children with type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
630. Glycaemic control and associated factors in a population of children and adolescents living with type 1 diabetes in Cameroon	Title	Outcome: not related to insulin treatment adherence
631. Glycaemic control in a type 1 diabetes clinic for younger adults.	Title	Population: not children (adults/foetuses)
632. Glycaemic control in type 1 diabetes mellitus among children and adolescents in a resource limited setting in Dar es Salaam - Tanzania.	Abstract	Outcome: not related to insulin treatment adherence
634. Glycaemic control of insulin-dependent diabetes mellitus in Sudan: Influence of insulin shortage	Included	
635. Glycaemic control of Type 1 diabetes in clinical practice early in the 21st century: an international comparison.	Title	Outcome: not related to insulin treatment adherence
636. Glycemic and lactate thresholds during incremental effort test in pubertal children with type 1 diabetes compared with healthy controls	Title	Outcome: not related to insulin treatment adherence
637. Glycemic control and associated factors among type 2 diabetic patients at Shanan Gibe Hospital, Southwest Ethiopia	Title	Population: do not have T1DM
638. Glycemic control and correlates in a group of sub Saharan type 1 diabetes adolescents.	Title	Outcome: not related to insulin treatment adherence
639. Glycemic control and executive function in adolescents with type 1 diabetes (T1d)	Abstract	Wrong study type (review, conference abstract etc.)
640. Glycemic control in adult type 1 diabetes patients from a brazilian country city: comparison between a multidisciplinary and a routine endocrinological approach.	Title	Population: not children (adults/foetuses)

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
641. Glycemic control with metformin or insulin therapy in adolescents with type 2 diabetes mellitus	Title	Population: do not have T1DM
642. Glycemic management using simple continuous subcutaneous insulin infusion in patients with type 2 diabetes	Title	Population: do not have T1DM
643. Glycemic outcomes and system adherence between age groups in pediatric subjects using a hybrid closed-loop pump	Abstract	Wrong study type (review, conference abstract etc.)
644. Glycemic variability: A peril of modern insulin therapy among youths with type 1 diabetes?	Title	Outcome: not related to insulin treatment adherence
645. Glycosylated hemoglobin feedback profile as one behavioral strategy for improving adherence to long-term regimens: Insulin dependent diabetes mellitus	Abstract	Wrong study type (review, conference abstract etc.)
646. Good adherence to the Mediterranean diet reduces the risk for NASH and diabetes in pediatric patients with obesity: The results of an Italian Study	Title	Outcome: not related to insulin treatment adherence
647. Good cop, bad cop: quality of parental involvement in type 1 diabetes management in youth.	Abstract	Wrong study type (review, conference abstract etc.)
648. Growth and body composition in type 1 diabetes mellitus.	Title	Outcome: not related to insulin treatment adherence
650. Growth monitoring in management of T1DM children from low-sosioeconomic status	Title	Outcome: not related to insulin treatment adherence
651. Health status, regimen adherence, and psychosocial functioning of minority youth with type 2 diabetes	Title	Population: do not have T1DM
652. Health-related quality of life (HRQOL) and its associated factors in children with Type 1 Diabetes Mellitus (T1DM)	Abstract	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
653. Health-related quality of life and its associated factors in children with type 1 diabetes mellitus		
654. Health-Related Stigma in Young Adults With Type 1 Diabetes Mellitus.	Title	Population: not children (adults/foetuses)
655. Health-risk behaviors and type 1 diabetes outcomes in the transition from late adolescence to early emerging adulthood	Included	
656. Healthcare costs and adherence associated with human regular U-500 versus high-dose U-100 insulin in patients with diabetes.	Full Text	Population: not children (adults/foetuses)
657. Helicobacter pylori infection and insulin requirement among children with type 1 diabetes mellitus	Title	Outcome: not related to insulin treatment adherence
659. Help 'difficult' adolescents with type 1 diabetes to improve metabolic control: The peter pan project	Abstract	Outcome: not related to insulin treatment adherence
660. Hepatic glycogenosis, a rare cause of hepatomegaly and abnormal liver enzymes in type 1 diabetes mellitus: A case report	Title	Outcome: not related to insulin treatment adherence
661. High intrapatient variability of calcineurin inhibitor levels is associated with post-transplant diabetes mellitus in pediatric kidney transplant	Title	Population: do not have T1DM
662. High-risk youth with diabetes need home-based behavioral interventions	Abstract	Wrong study type (review, conference abstract etc.)
663. Home-based behavioral health intervention: Use of a telehealth model to address poor adherence to type-1 diabetes medical regimens	Full Text	Outcome: not related to insulin treatment adherence
665. Home-based management can achieve intensification cost-effectively in type 1 diabetes	Full Text	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
666. Hope and mealtime insulin boluses are associated with depressive symptoms and glycemic control in youth with type 1 diabetes mellitus	Included	
667. Hospitalization of diabetics 12-30 years of age in Kuwait: Patients' characteristics, and frequency and reasons for admission	Title	Outcome: not related to insulin treatment adherence
668. How diabetes specialists treat their own diabetes: findings from a study of the AADE and ADA membership.	Title	Population: not children (adults/foetuses)
669. How do we educate young people to balance carbohydrate intake with adjustments of insulin?	Abstract	Outcome: not related to insulin treatment adherence
670. How effective are trained dogs at alerting their owners to changes in blood glycaemic levels?: Variations in performance of glycaemia alert dogs.	Title	Outcome: not related to insulin treatment adherence
671. How much do forgotten insulin injections matter to hemoglobin a1c in people with diabetes? A simulation study.	Abstract	Outcome: not related to insulin treatment adherence
672. How poorer quality of life in adolescence predicts subsequent type 1 diabetes management and control.	Abstract	Outcome: not related to insulin treatment adherence
673. How useful are serum IGF-I measurements for managing GH replacement therapy in adults and children?	Title	Outcome: not related to insulin treatment adherence
674. Huge transient elevation of liver enzymes during diabetic ketoacidosis	Title	Outcome: not related to insulin treatment adherence
675. Human Factors and Data Logging Processes With the Use of Advanced Technology for Adults With Type 1 Diabetes: Systematic Integrative Review.	Title	Population: not children (adults/foetuses)
676. Human factors associated with continuous glucose monitor use in patients with diabetes: A systematic review	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
677. Hydrolyzed infant formula and early beta-cell autoimmunity	Title	Outcome: not related to insulin treatment adherence
678. Hyperglycaemia and metabolic syndrome: Not always synonymous of T2D	Title	Outcome: not related to insulin treatment adherence
679. Hyperglycaemic emergencies are a common problem	Title	Outcome: not related to insulin treatment adherence
680. Hypoglycaemia and counterregulation during childhood.	Title	Outcome: not related to insulin treatment adherence
682. Hypoglycaemia and driving in people with insulin-treated diabetes: adherence to recommendations for avoidance.	Title	Outcome: not related to insulin treatment adherence
683. Hypoglycaemia in type 1 diabetes: technological treatments, their limitations and the place of psychology.	Abstract	Outcome: not related to insulin treatment adherence
684. Hypoglycemia and ketoacidosis with insulin pump therapy in children and adolescents	Abstract	Outcome: not related to insulin treatment adherence
685. Hypoglycemia unawareness is associated with reduced adherence to therapeutic decisions in patients with type 1 diabetes: evidence from a clinical audit.	Full Text	Population: not children (adults/foetuses)
686. Hypoglycemic episodes in an adolescent with diabetes type 1: A case report and a review of the literature	Title	Outcome: not related to insulin treatment adherence
687. Hypothalamic obesity: Pathogenesis and natural history	Title	Population: do not have T1DM
688. I get by with a little help from my family and friends: Adolescents' support for diabetes care	Included	
689. I know, so i do! Relationship between literacy and metabolic control in patients with type i diabetes	Abstract	Wrong study type (review, conference abstract etc.)

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
690. Identification of clinically relevant dysglycemia phenotypes based on continuous glucose monitoring data from youth with type 1 diabetes and elevated hemoglobin A1c	Title	Outcome: not related to insulin treatment adherence
691. Identifying and preventing eating disorders in youth with diabetes	Title	Outcome: not related to insulin treatment adherence
692. Identity and treatment adherence in predominantly ethnic minority teens and young adults with type 1 diabetes	Full Text	Outcome: not related to insulin treatment adherence
693. Illness perceptions and self efficacy beliefs in adolescents and young adults with insulin dependent diabetes mellitus	Included	
694. Illness representations and glycemic control in adolescents with type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
695. Illness representations predict adherence in adolescents and young adults with type 1 diabetes	Included	
697. Illness specific self-esteem in adolescents with type 1 diabetes	Abstract	Wrong study type (review, conference abstract etc.)
698. Illness-Specific Risk-Taking in Adolescence: A Missing Piece of the Nonadherence Puzzle for Youth With Type 1 Diabetes?	Full Text	Wrong study type (review, conference abstract etc.)
699. Immediate management of diabetic ketoacidosis (DKA) in the emergency department (ED): What needs improvement?	Title	Outcome: not related to insulin treatment adherence
700. Immune responses to an encapsulated allogeneic islet beta-cell line in diabetic NOD mice.	Title	Outcome: not related to insulin treatment adherence
701. Immunotherapy-based strategies for the treatment of autoimmune diabetes: searching for the cure.	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
702. Impact of a high-monounsaturated-fat diet on lipid profile in subjects with type 1 diabetes.	Title	Outcome: not related to insulin treatment adherence
703. Impact of a serious videogame designed for flexible insulin therapy on the knowledge and behaviors of children with type 1 diabetes: The LUDIDIAB pilot study	Full Text	Outcome: not related to insulin treatment adherence
705. Impact of ambulatory, family-focused teamwork intervention on glycemic control in youth with type 1 diabetes.	Abstract	Outcome: not related to insulin treatment adherence
706. Impact of combination therapy with dulaglutide and SGLT2i on vascular age, an indicator of cardiovascular risk, in Indian adults with type 2 diabetes: A real-world study	Title	Population: not children (adults/foetuses)
707. Impact of disease-management programs on metabolic control in patients with type 1 diabetes mellitus	Title	Outcome: not related to insulin treatment adherence
708. Impact of elective hospital admissions on glycaemic control in adolescents with poorly controlled type 1 diabetes.	Abstract	Outcome: not related to insulin treatment adherence
709. Impact of family environment and support on adherence, metabolic control, and quality of life in adolescents with diabetes.	Included	
710. Impact of family factors on metabolic control and on regimen adherence in type 1 diabetes among Hispanic and African-American adolescents	Abstract	Wrong study type (review, conference abstract etc.)
711. Impact of long-term use of eHealth systems in adolescents with type 1 diabetes treated with sensor-augmented pump therapy	Full Text	Outcome: not related to insulin treatment adherence
713. Impact of nutrition on type 1 diabetes management and outcomes	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
714. Impact of patient education on diabetic distress & clinical outcomes in type II diabetes mellitus patients	Title	Population: do not have T1DM
715. Impact of psychology services in an integrated pediatric endocrinology clinic	Abstract	Wrong study type (review, conference abstract etc.)
716. Impact of SMBG on control of diabetes as measured by HbA1. 3-yr Survey of a juvenile IDDM clinic	Title	Outcome: not related to insulin treatment adherence
717. Impact of telemedicine in managing type 1 diabetes among school-age children and adolescents: an integrative review.	Abstract	Outcome: not related to insulin treatment adherence
718. Impact of type 1 diabetes mellitus and celiac disease on nutrition and quality of life.	Title	Outcome: not related to insulin treatment adherence
719. Impacto psicosocial de la diabetes mellitus tipo 1 en ninos, adolescentes y sus familias. Revision de la literaturaPsychosocial impact of type 1 diabetes mellitus in children, adolescents and their families. Literature review	Title	Wrong study type (review, conference abstract etc.)
720. Impaired absorption and omission of insulin: a novel method of detection using the diabetes advisory system computer model.	Abstract	Population: not children (adults/foetuses)
721. Impaired awareness of hypoglycemia in children and adolescents with type 1 diabetes mellitus in north of Jordan	Title	Outcome: not related to insulin treatment adherence
722. Impaired left-ventricular function in insulin-dependent diabetic patients with increased urinary albumin excretion.	Title	Outcome: not related to insulin treatment adherence
723. Implementation of a multicomponent process to obtain informed consent in the Diabetes Control and Complications Trial. The DCCT Research Group.	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
724. Implementation of treatment protocols in the diabetes control and complications trial	Title	Outcome: not related to insulin treatment adherence
725. Implementing a pathway for the investigation of Cystic Fibrosis-Related Diabetes in a paediatric cystic fibrosis clinic	Title	Population: do not have T1DM
726. Importancia de los sistemas de informacion en programas de salud publica: bases de datos de pacientes diabeticos[Importance of the information systems in public health programs: diabetic patients databases]	Title	Outcome: not related to insulin treatment adherence
727. Important determinants of diabetes control in insulin pump therapy in patients with type 1 diabetes mellitus	Abstract	Outcome: not related to insulin treatment adherence
729. Improper Insulin Compliance May Lead to Hepatomegaly and Elevated Hepatic Enzymes in Type 1 Diabetic Patients [7]	Full Text	Outcome: not related to insulin treatment adherence
730. Improper insulin compliance may lead to hepatomegaly and elevated hepatic enzymes in type 1 diabetic patients: Response to Yu and Howard [8]	Abstract	Wrong study type (review, conference abstract etc.)
731. Improved BMI in long-term tube-fed pediatric patients with use of a clinic survey	Title	Population: do not have T1DM
732. Improved glycemic control and acute complications among children with type 1 diabetes mellitus in Moshi, Tanzania.	Title	Outcome: not related to insulin treatment adherence
733. Improvement of diabetic control and acceptability of a three-injection insulin regimen in diabetic adolescents: A multicenter controlled study	Abstract	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
734. Improvement of the compliance with blood glucose monitoring in young insulin-dependent diabetes mellitus patients by the Sensorlink(TM) system	Title	Outcome: not related to insulin treatment adherence
735. Improving adherence to blood glucose testing in insulin-dependent diabetic children	Title	Outcome: not related to insulin treatment adherence
736. Improving care for pediatric diabetic ketoacidosis	Title	Outcome: not related to insulin treatment adherence
737. Improving children's compliance with diabetes management	Full Text	Wrong study type (review, conference abstract etc.)
738. Improving compliance with exercise in adolescents with insulin-dependent diabetes mellitus: results of a self-motivated home exercise program.	Title	Outcome: not related to insulin treatment adherence
739. In adult patients with type 1 diabetes healthy lifestyle associates with a better cardiometabolic profile.	Title	Population: not children (adults/foetuses)
740. In pursuit of excellence in diabetes care: trends in insulin delivery.	Full Text	Outcome: not related to insulin treatment adherence
741. In situ simulation-based study to determine adherence to pediatric diabetic ketoacidosis management guidelines	Title	Outcome: not related to insulin treatment adherence
742. In vitro-generation of surrogate islets from adult stem cells.	Title	Outcome: not related to insulin treatment adherence
744. In vivo microscopy of murine islets of Langerhans: increased adhesion of transferred lymphocytes to islets depends on macrophage-derived cytokines in a model of organ-specific insulitis.	Title	Outcome: not related to insulin treatment adherence
745. In-home nighttime predictive low glucose suspend experience in children and adults with type 1 diabetes.	Full Text	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
746. Incidence and prevalence of insulin-dependent diabetes mellitus in the zero- to 19-years' age-group in Sydney	Title	Outcome: not related to insulin treatment adherence
747. Incidence of symptomatic mild hypoglycaemic events: A prospective study in adult patients with insulin-treated diabetes mellitus using a portable microcomputer-based data-logger	Title	Population: not children (adults/foetuses)
748. Incorporating Long-Acting Insulin Glargine into the UVA/ Padova Type 1 Diabetes Simulator for In Silico Testing of MDI Therapies.	Title	Outcome: not related to insulin treatment adherence
749. Increasing the adherence of diabetic adolescents.	Full Text	Population: not children (adults/foetuses)
750. Individualized growth hormone therapy in children: Advances beyond weight-based dosing	Title	Population: do not have T1DM
751. Influence of food consumption in glycemic control and the cardiometabolic risk of children and adolescents with diabetes mellitus type 1	Title	Outcome: not related to insulin treatment adherence
752. Influence of imaginative teaching of diet on compliance and metabolic control in insulin dependent diabetes.	Title	Outcome: not related to insulin treatment adherence
753. Influence of intensive education coupled with counseling on glycosylated hemoglobin levels and other parameters of diabetes control in pediatric patients with type 1 diabetes mellitus in India	Abstract	Outcome: not related to insulin treatment adherence
754. Inhaled human insulin.	Title	Outcome: not related to insulin treatment adherence
755. Inhaled insulin in diabetes mellitus.	Title	Outcome: not related to insulin treatment adherence
757. Inhaled insulin: overview of a novel route of insulin administration.	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
758. Inhaled therapy: A commercial success but a therapeutic embarrassment. Are we seeing the first signs of change? << plus ca change, plus c'est la meme chose >>	Title	Outcome: not related to insulin treatment adherence
759. Injection distress, quality of life and treatment adherence in a sample of youth with type 1 diabetes	Abstract	Wrong study type (review, conference abstract etc.)
760. Insights into the percutaneous penetration of antidiabetic agents.	Abstract	Outcome: not related to insulin treatment adherence
761. Institution of basal-bolus therapy at diagnosis for children with type 1 diabetes mellitus.	Abstract	Outcome: not related to insulin treatment adherence
762. Insulin adherence behaviours and barriers in the multinational Global Attitudes of Patients and Physicians in Insulin Therapy study.	Full Text	Population: not children (adults/foetuses)
763. Insulin adherence in patients with diabetes: Risk factors for injection omission	Full Text	Population: not children (adults/foetuses)
764. Insulin administration and the impacts of forgetting a dose.	Abstract	Population: not children (adults/foetuses)
766. Insulin allergy can be successfully managed by a systematic approach	Title	Outcome: not related to insulin treatment adherence
767. Insulin bolus dose calculator: A web app to create an insulin dose spreadsheet	Abstract	Wrong study type (review, conference abstract etc.)
768. Insulin bolusing software: The potential to optimize health outcomes in type 1 diabetes mellitus	Included	
770. Insulin delivery by injection in children and adolescents with diabetes	Abstract	Wrong study type (review, conference abstract etc.)
772. Insulin delivery using hollow microneedles in children with type 1 diabetes	Abstract	Wrong study type (review, conference abstract etc.)
773. Insulin dependent diabetes mellitus: Regimen adherence in children and young people		

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
774. Insulin detemir in a twice daily insulin regimen versus a three times daily insulin regimen in the treatment of type 1 diabetes in children: A pilot randomized controlled trial	Full Text	Outcome: not related to insulin treatment adherence
776. Insulin for children, education for the life	Abstract	Wrong study type (review, conference abstract etc.)
777. Insulin glargine 300 U/mL in the management of diabetes: clinical utility and patient perspectives.	Abstract	Outcome: not related to insulin treatment adherence
778. Insulin Injection Technique Questionnaire: results of an international study comparing Brazil, Latin America and World data.	Full Text	Population: not children (adults/foetuses)
779. Insulin manipulation as an indicator of psychiatric comorbidity in children and adolescents with type 1 diabetes mellitus	Abstract	Wrong study type (review, conference abstract etc.)
780. Insulin omission in women with IDDM	Full Text	Population: not children (adults/foetuses)
781. Insulin pen use and diabetes treatment goals: A study from Iran STEPS 2016 survey	Abstract	Population: not children (adults/foetuses)
782. Insulin Pump Adherence Behaviors Do Not Correlate With Glycemic Variability Among Youth With Type 1 Diabetes (T1D).	Full Text	Outcome: not related to insulin treatment adherence
783. Insulin pump at the onset of type 1 diabetes: An expensive toy or a wise choice?	Abstract	Outcome: not related to insulin treatment adherence
784. Insulin Pump Combined with Flash Glucose Monitoring: A Therapeutic Option to Improve Glycemic Control in Severely Nonadherent Patients with Type 1 Diabetes.	Full Text	Population: not children (adults/foetuses)
785. Insulin pump therapy - Practical aspects	Abstract	Outcome: not related to insulin treatment adherence
786. Insulin Pump Therapy for Type 1 Diabetes	Abstract	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
787. Insulin pump therapy in Type 1 pediatric patients: Now and into the year 2000	Abstract	Wrong study type (review, conference abstract etc.)
788. Insulin pump use in young adolescents with type 1 diabetes: A descriptive study	Abstract	Outcome: not related to insulin treatment adherence
790. Insulin Pumps in Type 1 Diabetes with Mental Disorders: Real-Life Clinical Data Indicate Discrepancies to Recommendations.	Abstract	Outcome: not related to insulin treatment adherence
791. Insulin resistance: Policy plan to address burning issue by NGO from rural India	Title	Outcome: not related to insulin treatment adherence
792. Insulin therapy during diabetic ketoacidosis in children	Title	Outcome: not related to insulin treatment adherence
793. Insulin therapy in Europe.	Abstract	Outcome: not related to insulin treatment adherence
794. Insulin therapy in type 2 diabetes for physicians and practitioners.	Title	Population: do not have T1DM
795. Insulin therapy regimens in paediatric age	Abstract	Outcome: not related to insulin treatment adherence
796. Insulin withholding for weight control in women with diabetes	Full Text	Population: not children (adults/foetuses)
797. Insulin-coated gold nanoparticles as a new concept for personalized and adjustable glucose regulation.	Title	Outcome: not related to insulin treatment adherence
798. Insulin-dependent diabetes mellitus in childhood	Abstract	Wrong study type (review, conference abstract etc.)
799. Insulin-induced oedema in a patient with diabetes mellitus complicated by ketoacidosis	Title	Outcome: not related to insulin treatment adherence
801. Insulin-treated diabetes patients with fear of self-injecting or fear of self-testing: psychological comorbidity and general well-being.	Abstract	Population: not children (adults/foetuses)
802. Integrated insulin pump therapy with continuous glucose monitoring for improved adherence: technology update.	Abstract	Population: not children (adults/foetuses)

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
803. Intensive diabetes education program and multidisciplinary team approach in management of newly diagnosed type 1 diabetes mellitus: a greater patient benefit, experience at Siriraj Hospital.	Abstract	Outcome: not related to insulin treatment adherence
804. INTENSIVIERTE INSULIN-THERAPIE BEI ADOLESZENTEN MIT DIABETES MELLITUS TYP I: ERSTE ERFAHRUNGEN MIT DEM HALBAUTOMATISCHEN INSULIN-INJEKTIONSGERAT (INSULIN-PEN)Intensified insulin therapy in adolescents with type I diabetes mellitus: First experience with insulin pen	Full Text	Population: not children (adults/foetuses)
805. INTENSIVIERTE KONVENTIONELLE INSULINTHERAPIE. LANGZEITERFOLGE UND GRUNDE FUR DAS VERSAGEN DIESES THERAPIEKONZEPTESIntensified conventional insulin treatment: Long-term results and reasons for failure of this treatment concept	Abstract	Outcome: not related to insulin treatment adherence
806. Interaction of pubertal development and metabolic control in 1303 adolescents with diabetes mellitus type 1	Title	Outcome: not related to insulin treatment adherence
807. Interdisciplinary education group in type 1 diabetes	Abstract	Wrong study type (review, conference abstract etc.)
808. Interim report on the effective intraperitoneal therapy of insulin-dependent diabetes mellitus in pet dogs using "Neo-Islets," aggregates of adipose stem and pancreatic islet cells (INAD 012-776).	Title	Population: not humans
809. Intermittent hypoxia maintains glycemia in streptozotocin-induced diabetic rats.	Title	Population: not humans

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
810. Interplay between Type 1 Diabetes Mellitus and Celiac Disease: Implications in Treatment.	Abstract	Outcome: not related to insulin treatment adherence
811. INTERPRET, an international report on routine practice of sensor-augmented pump therapy: Results from the 6 months interim analysis of the pediatric population	Abstract	Outcome: not related to insulin treatment adherence
812. INTERPRET, an international report on routine practice of sensorenabled pump therapy: Result from the 6 months interim analysis	Abstract	Outcome: not related to insulin treatment adherence
813. Intervention needed to optimize insulin pump use	Abstract	Wrong study type (review, conference abstract etc.)
814. Interventions with adherence-promoting components in pediatric type 1 diabetes: meta-analysis of their impact on glycemic control.	Abstract	Outcome: not related to insulin treatment adherence
815. Intrinsic motivation in minority youths with type 1 diabetes	Abstract	Wrong study type (review, conference abstract etc.)
816. Is compliance with diabetes retinopathy (DR) screening associated with achievement of therapeutic goals in youth with type 1 diabetes (T1DM)?	Title	Outcome: not related to insulin treatment adherence
817. Is continuous glucose monitoring (CGM) for everyone? To whom should CGM be prescribed and how?	Abstract	Outcome: not related to insulin treatment adherence
818. Is everything new necessarily better? The pros and cons of new technology	Title	Outcome: not related to insulin treatment adherence
819. Is insulin pump therapy effective in Type 1 diabetes?	Abstract	Outcome: not related to insulin treatment adherence
820. Is it useful to propose insulin pump at the onset of type 1 diabetes mellitus (T1DM)?	Abstract	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
821. Is living a dolce vita with diabetes possible?-metabolic control and quality of life in patients treated with 640G system	Abstract	Wrong study type (review, conference abstract etc.)
822. Is the frequency of self-monitoring of blood glucose related to long-term metabolic control? Multicenter analysis including 24,500 patients from 191 centers in Germany and Austria.	Title	Outcome: not related to insulin treatment adherence
823. ISPAD and its role in the management of diabetes in the young in the Indian subcontinent and the Far East	Title	Outcome: not related to insulin treatment adherence
824. Italian multicentre study of intensive therapy with insulin lispro in 1184 patients with Type 1 diabetes.	Abstract	Outcome: not related to insulin treatment adherence
825. Juvenile diabetes	Abstract	Wrong study type (review, conference abstract etc.)
826. Juvenile insulin dependent diabetes control, a reflection on patient satisfaction and their awareness in a peripheral hospital	Abstract	Wrong study type (review, conference abstract etc.)
827. Key considerations when repositioning a known drug for inhalation therapy	Title	Outcome: not related to insulin treatment adherence
828. La retinopathie diabetique du sujet jeune: l'Enfant et l'adolescentDiabetic retinopathy in children and adolescents	Title	Outcome: not related to insulin treatment adherence
829. Labour productivity effects of prescribed medicines for chronically ill workers	Abstract	Population: not children (adults/foetuses)
830. Lactobacillus reuteri oral administration improves periodontal disease in children and adolescents with type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
831. Learned helplessness in diabetic youths	Full Text	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
832. Left ventricular mass and arterial compliance: relation to coronary heart disease and its risk factors in South Indian adults.	Title	Population: not children (adults/foetuses)
833. Lessons learned from a pilot RCT of simultaneous versus delayed initiation of continuous glucose monitoring in children and adolescents with type 1 diabetes starting insulin pump therapy	Abstract	Outcome: not related to insulin treatment adherence
835. Lifestyle and cardiometabolic risk in adults with type 1 diabetes: a review.	Title	Population: not children (adults/foetuses)
836. Lipoatrophy in a girl after switching insulin analog injection to a pump	Abstract	Outcome: not related to insulin treatment adherence
837. Lived experience of diabetes among older, rural people	Title	Population: not children (adults/foetuses)
838. Locus of control beliefs predicting oral and diabetes health behavior and health status	Abstract	Outcome: not related to insulin treatment adherence
839. Long term experiences with a computerized diabetes management and glucose monitoring system in insulin-dependent diabetic patients	Abstract	Outcome: not related to insulin treatment adherence
840. Long-Term Adherence to Automated Bolus Calculators.	Full Text	Population: not children (adults/foetuses)
841. Long-term benefits of continuous subcutaneous insulin infusion in children with Type 1 diabetes: A 4-year follow-up	Abstract	Outcome: not related to insulin treatment adherence
843. Long-Term Efficacy and Safety of Sensor Augmented Insulin Pump Therapy with Low-Glucose Suspend Feature in Patients with Type 1 Diabetes.	Abstract	Outcome: not related to insulin treatment adherence
844. Long-term glycaemic control achieved in young insulin-dependent diabetics	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
845. Long-term metformin treatment in adolescents with obesity and insulin resistance, results of an open label extension study	Title	Population: do not have T1DM
846. Long-term outcomes of continuous glucose monitoring in young children with type 1 diabetes undergoing insulin pump therapy: A retrospective evaluation	Abstract	Outcome: not related to insulin treatment adherence
847. Longitudinal associations of maternal depressive symptoms, maternal involvement, and diabetes management across adolescence.	Included	
848. Low Carbohydrate and Low-Fat Diets: What We Don't Know and Why we Should Know It.	Title	Outcome: not related to insulin treatment adherence
849. Low carbohydrate diet in type 1 diabetes, long-term improvement and adherence: A clinical audit.	Title	Outcome: not related to insulin treatment adherence
850. Low discomfort and pain associated with intensified insulin therapy in children and adolescents.	Full Text	Outcome: not related to insulin treatment adherence
851. Lower executive functioning associated with greater diabetes-specific risk-taking in adolescents with type 1 diabetes	Abstract	Wrong study type (review, conference abstract etc.)
852. Lower plasma insulin levels during overnight closed-loop in school children with type 1 diabetes: Potential advantage? A randomized cross-over trial.	Title	Outcome: not related to insulin treatment adherence
853. Making Insulin Accessible: Does Inhaled Insulin Fill an Unmet Need?	Abstract	Wrong study type (review, conference abstract etc.)
854. Management and outcomes in paediatric ketoacidosis-West Midlands experience	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
855. Management of children with type 1 diabetes during illness: a national survey.	Abstract	Outcome: not related to insulin treatment adherence
856. Management of cystic fibrosis related diabetes: A survey of UK cystic fibrosis centers	Title	Population: do not have T1DM
857. Management of diabetes in Morocco: results of the International Diabetes Management Practices Study (IDMPS) - wave 5.	Abstract	Outcome: not related to insulin treatment adherence
858. Management of diabetic ketoacidosis in children and adolescents.	Title	Outcome: not related to insulin treatment adherence
860. Management of diabetic ketoacidosis in limited resource setting	Title	Outcome: not related to insulin treatment adherence
861. Management of juvenile diabetes	Abstract	Outcome: not related to insulin treatment adherence
862. Management of ketosis-prone type 2 diabetes mellitus.	Title	Population: do not have T1DM
863. Management of third-trimester diabetic pregnancies with the use of continuous subcutaneous insulin infusion therapy: a pilot study.	Abstract	Population: not children (adults/foetuses)
864. Managing diabetic ketoacidosis: Keeping with the programme	Title	Outcome: not related to insulin treatment adherence
865. Managing insulin-dependent diabetes mellitus in adolescence: A developmental perspective	Abstract	Wrong study type (review, conference abstract etc.)
866. Managing psychosocial issues in a family with diabetes	Full Text	Wrong study type (review, conference abstract etc.)
867. Managing special occasions and fasts	Abstract	Wrong study type (review, conference abstract etc.)
868. Maternal depressive symptoms and disease care behaviors in youths with type 1 diabetes: A mediational model	Abstract	Wrong study type (review, conference abstract etc.)
869. Mauriac syndrome: A case report	Title	Outcome: not related to insulin treatment adherence
870. Mauriac syndrome: A rare differential diagnosis of abnormal liver tests in diabetic patients	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
871. Mauriac Syndrome: A Rare Hepatic Glycogenosis in Poorly Controlled Type 1 Diabetes.	Title	Outcome: not related to insulin treatment adherence
872. Mauriac syndrome: Still exists and haunts us from time to time. A case series	Title	Outcome: not related to insulin treatment adherence
873. Mauriac's syndrome: An uncommon and old complication of type 1 diabetes mellitus	Title	Outcome: not related to insulin treatment adherence
874. May gender influence the quality of life in children and adolescents with type 1 diabetes?	Abstract	Outcome: not related to insulin treatment adherence
875. Mealtime insulin bolus adherence and glycemic control in adolescents on insulin pump therapy	Abstract	Outcome: not related to insulin treatment adherence
876. Measures of Adherence and Challenges in Using Glucometer Data in Youth with Type 1 Diabetes: Rethinking the Value of Self-Report.	Abstract	Outcome: not related to insulin treatment adherence
877. Measuring illness management behaviors on intensive insulin regimens: A revision of the twenty-four hour recall interview	Abstract	Outcome: not related to insulin treatment adherence
878. Medication adherence and economic problem among patients with type 1 diabetes in Central Java Province , Indonesia	Abstract	Wrong study type (review, conference abstract etc.)
879. Metabolic control and compliance with self-monitoring of blood glucose in adolescents and young adults with type 1 diabetes: Results of the I-NewTrend randomized clinical trial	Title	Outcome: not related to insulin treatment adherence
880. Metabolic control and diet in Finnish diabetic adolescents	Title	Outcome: not related to insulin treatment adherence
881. Metabolic control and treatment patterns in patients with type 1 diabetes in Castilla-La Mancha: the DIAbetes tipo 1 in Castilla La Mancha study.	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
882. Metabolic control in adolescents with diabetes: An examination of systemic variables	Title	Outcome: not related to insulin treatment adherence
883. Metabolic control in children and adolescents with insulin-dependent diabetes mellitus	Title	Outcome: not related to insulin treatment adherence
884. Metabolic control in emerging adults with type 1 diabetes	Title	Population: not children (adults/foetuses)
885. Metabolic outcomes in overweight adults according to birth weight and overweight onset	Title	Population: not children (adults/foetuses)
886. Metabolische hepatopathie bei einem 16-jahrigen jungen mit diabetes mellitus: Eine diagnostische und therapeutische herausforderungMetabolic hepatopathy in a 16 year old boy with diabetes. A diagnostic and therapeutic challenge	Title	Outcome: not related to insulin treatment adherence
887. Metformin as additional therapy in adolescents with poorly controlled type 1 diabetes: randomised placebo-controlled trial with aspects on insulin sensitivity.	Title	Outcome: not related to insulin treatment adherence
888. Metformin improves vascular function in children and adolescents with type 1 diabetes: The adelaide metformin RCT trial	Title	Outcome: not related to insulin treatment adherence
889. Metformin in adults with type 1 diabetes: Design and methods of REducing with MetfOrmin Vascular Adverse Lesions (REMOVAL): An international multicentre trial.	Title	Population: not children (adults/foetuses)
890. Metformin levels and adherence in children and adolescents with type 1 diabetes enrolled in a 12 month randomised controlled trial	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
891. Methods for insulin delivery and glucose monitoring in diabetes: summary of a comparative effectiveness review	Abstract	Outcome: not related to insulin treatment adherence
892. Methods for Insulin Delivery and Glucose Monitoring: Comparative Effectiveness	Abstract	Outcome: not related to insulin treatment adherence
893. Microalbuminuria in diabetes mellitus - Efficacy of a new screening method in comparison with timed overnight urine collection	Title	Outcome: not related to insulin treatment adherence
894. MicroRNAs and histone deacetylase inhibition-mediated protection against inflammatory ß-cell damage.	Title	Outcome: not related to insulin treatment adherence
895. Mindfulness-based Group Intervention for an Adolescent Girl at Risk for Type 2 Diabetes: A Case Report	Title	Population: do not have T1DM
896. Missed insulin boluses for snacks in youth with type 1 diabetes.	Abstract	Outcome: not related to insulin treatment adherence
897. Missed Medical Appointments and Disease Control in Children With Type 1 Diabetes.	Full Text	Outcome: not related to insulin treatment adherence
898. Mixing rapid-acting insulin analogues with insulin glargine in children with type 1 diabetes mellitus.	Abstract	Outcome: not related to insulin treatment adherence
899. Mobile Momentary Assessment and Biobehavioral Feedback for Adolescents with Type 1 Diabetes: Feasibility and Engagement Patterns.	Abstract	Outcome: not related to insulin treatment adherence
900. Mobile phone support is associated with reduced ketoacidosis in young adults.	Title	Population: not children (adults/foetuses)
901. Model of associations between psychosocial variables and health-outcome measures of adolescents with IDDM	Included	

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
902. Modern clinical management helps reducing the impact of type 1 diabetes in children	Abstract	Outcome: not related to insulin treatment adherence
904. MODERNE ASPEKTE DER THERAPIE DES INSULINABHANGIGEN DIABETES MELLITUS BEI KINDERN UND JUGENDLICHENModern aspects of therapy in insulin-dependent diabetes mellitus in children and adolescents	Abstract	Wrong study type (review, conference abstract etc.)
905. MODY2 and type 1 diabetes in a pediatric patient who developed DKA	Title	Outcome: not related to insulin treatment adherence
906. Momentary Predictors of Insulin Restriction Among Adults With Type 1 Diabetes and Eating Disorder Symptomatology.	Title	Population: not children (adults/foetuses)
907. Momentary sampling using personal digital assistants (PDAs) to assess adherence in teens with type 1 diabetes (T1D): Feasibility, burden and acceptability	Abstract	Outcome: not related to insulin treatment adherence
908. Morbidity and mortality of diabetic ketoacidosis with and without insulin pump care.	Abstract	Outcome: not related to insulin treatment adherence
910. Motor vehicle accidents during episodes of hypoglycaemia--case reports and lessons to be learnt.	Title	Outcome: not related to insulin treatment adherence
911. Moving Into Action: Informing Policy and Strengthening Healthcare Systems in Asia Pacific	Title	Outcome: not related to insulin treatment adherence
912. Multicenter closed-loop/hybrid meal bolus insulin delivery with type 1 diabetes.	Abstract	Outcome: not related to insulin treatment adherence
913. Multicentre study on prevalence of endocrine complications in thalassaemia major	Title	Population: do not have T1DM

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
914. Multicentre study on prevalence of endocrine complications in thalassaemia major. Italian Working Group on Endocrine Complications in Non-endocrine Diseases.	Title	Population: do not have T1DM
915. Multidisciplinary care on type 1 diabetics: "ADINF doce vida Nova Friburgo" project	Abstract	Wrong study type (review, conference abstract etc.)
916. Multidisciplinary treatment of pediatric obesity	Title	Population: do not have T1DM
917. Multifamily group problem-solving intervention for adherence challenges in pediatric insulin-dependent diabetes	Full Text	Outcome: not related to insulin treatment adherence
918. Multivariate assessment of adherence and glycemic control in youth with type 1 diabetes	Abstract	Wrong study type (review, conference abstract etc.)
919. Neurog3 misexpression unravels mouse pancreatic ductal cell plasticity.	Title	Population: not humans
920. New concepts in diabetes: how multihormonal regulation can improve glycemic control.	Title	Outcome: not related to insulin treatment adherence
921. New insights in CF-related diabetes	Title	Population: do not have T1DM
922. New insulins and quality of life.	Full Text	Wrong study type (review, conference abstract etc.)
923. New onset type 1 diabetes in the pediatric population of a second level hospital: 12 years' review and evaluation of recent treatment and connection between hospitals	Title	Outcome: not related to insulin treatment adherence
924. New paradigms for growth hormone therapy in children	Title	Population: do not have T1DM
925. New technologies for promoting hypoglycaemia self-management in type 1 diabetic children	Title	Outcome: not related to insulin treatment adherence
926. Nicotinamide protected first-phase insulin response (FPIR) and prevented clinical disease in first-degree relatives of type-1 diabetics	Title	Population: do not have T1DM

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
928. No effect of insulin pen with memory function on glycemic control in a patient cohort with poorly controlled type 1 diabetes: A randomized open-label study	Full Text	Population: not children (adults/foetuses)
930. No effect of the FitFor2 exercise programme on blood glucose, insulin senesitivity, and birthweight in pregnant women who were overweight and at risk for gestational diabetes : results of a randomised controlled trial.	Title	Population: do not have T1DM
931. Non-compliance of insulin pump users; questionnaire and case reports	Abstract	Outcome: not related to insulin treatment adherence
932. Non-insulin-dependent diabetes mellitus in Indian children in Manitoba	Title	Population: do not have T1DM
933. Nonadherence to insulin therapy in low-income, type 2 diabetic patients.	Title	Population: do not have T1DM
934. Noncommunicable disease management in resource-poor settings: a primary care model from rural South Africa.	Title	Outcome: not related to insulin treatment adherence
935. Normalizing blood glucose levels in children with type I diabetes: Mystery motivators used within the context of behavioral consultation models	Abstract	Wrong study type (review, conference abstract etc.)
936. NOUVELLES TECHNIQUES D'ADMINISTRATION DE L'INSULINE LES MULTI-INJECTIONS A L'AIDE DE STYLOS INJECTEURSNew techniques of insulin administration: Multiple injections by means of injection pens	Full Text	Outcome: not related to insulin treatment adherence
937. Novel therapies in the management of type I diabetes mellitus.	Abstract	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
938. NovoPen EchoTM for the delivery of insulin in paediatric patients: A comparison of usability, functionality and preference among patients, their parents and healthcare professionals	Abstract	Wrong study type (review, conference abstract etc.)
939. Numerical and clinical precision of continuous glucose monitoring in Colombian patients treated with insulin infusion pump with automated suspension in hypoglycemia.	Abstract	Outcome: not related to insulin treatment adherence
940. Nutritional management of children and adolescents with insulin-dependent diabetes mellitus: A review by the Diabetes Care and Education dietetic practice group	Title	Outcome: not related to insulin treatment adherence
941. Objectively Measured Adherence in Adolescents With Type 1 Diabetes on Multiple Daily Injections and Insulin Pump Therapy	Full Text	Outcome: not related to insulin treatment adherence
942. Observational study of diabetes management in type 1 diabetic school-age children during holiday versus school days	Full Text	Outcome: not related to insulin treatment adherence
944. OcobeHHocT HcyHoTepa p caxapHoM dabeTe 1 Ta y deTe odpocTkoB, oyayux yukokopTkodblCharacteristics of insulin therapy of diabetes mellitus type 1 in children and adolescents receiving glucocorticoids	Abstract	Outcome: not related to insulin treatment adherence
945. Optimal pump settings differ according to age and insulin dose	Title	Outcome: not related to insulin treatment adherence
946. Optimal Use of Diabetes Devices: Clinician Perspectives on Barriers and Adherence to Device Use.	Full Text	Population: not children (adults/foetuses)
947. Optimization of insulin treatment in children	Full Text	Wrong study type (review, conference abstract etc.)

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
948. Optimizing insulin pump therapy: a quality improvement project.	Abstract	Outcome: not related to insulin treatment adherence
949. Optimum bolus wizard settings in insulin pumps in children with Type 1 diabetes	Abstract	Outcome: not related to insulin treatment adherence
950. Oral glucose tolerance testing: A quality improvement initiative to increase adherence	Title	Population: do not have T1DM
951. Oral hypoglycemic glibenclamide: Can it be a substitute to insulin in the management of gestational diabetes mellitus? a comparative study	Title	Population: do not have T1DM
952. Oral insulin: an update.	Title	Outcome: not related to insulin treatment adherence
953. Our initial experience with insulin pump treatment	Abstract	Outcome: not related to insulin treatment adherence
954. Outcomes of a rural model of extended adolescent diabetes care to mid 20s without transition to adult services	Title	Population: not children (adults/foetuses)
955. Outcomes of admissions with diabetic ketoacidosis (DKA) compared to the national British Society of Paediatric Endocrinology and Diabetes (BSPED) guidelines	Title	Outcome: not related to insulin treatment adherence
956. Outpatient-to-inpatient transition of insulin pump therapy: successes and continuing challenges.	Abstract	Population: not children (adults/foetuses)
957. Outside-hospital assistance for children and adolescents with type 1 diabetes mellitus	Title	Outcome: not related to insulin treatment adherence
959. Overcoming the challenges in the nutritional management of toddlers with diabetes	Abstract	Wrong study type (review, conference abstract etc.)
960. Paediatric diabetes in Tanzania: Problems and perspectives	Abstract	Wrong study type (review, conference abstract etc.)
961. Paediatric diabetes: achieving practical, effective insulin therapy in type 1 and type 2 diabetes.	Abstract	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
962. Paediatric non-ketotic hyperglycaemic hemichorea-hemiballismus.	Title	Population: do not have T1DM
963. Pancreatic islet transplantation.	Title	Outcome: not related to insulin treatment adherence
964. Pancreatic stem cells: a therapeutic agent that may offer the best approach for curing type 1 diabetes.	Title	Outcome: not related to insulin treatment adherence
965. Parent and child perceptions of the management of juvenile diabetes	Included	
966. Parent-child relationships and the management of insulin-dependent diabetes mellitus	Included	
967. Parental expectations about their involvement in diabetes management: Reliability and validity of the outcome expectations of parental involvement (OEPI) scale	Abstract	Outcome: not related to insulin treatment adherence
968. Parental involvement and adolescents' diabetes management: the mediating role of self-efficacy and externalizing and internalizing behaviors.	Included	
969. Parental involvement buffers associations between pump duration and metabolic control among adolescents with type 1 diabetes.	Abstract	Outcome: not related to insulin treatment adherence
970. Parental involvement in diabetes management tasks: Relationships to blood glucose monitoring adherence and metabolic control in young adolescents with insulin-dependent diabetes mellitus	Title	Outcome: not related to insulin treatment adherence
971. Parental involvement in regimen responsibilities: Implications for the adherence behaviors and psychosocial adjustment of adolescents with insulin-dependent diabetes mellitus	Abstract	Wrong study type (review, conference abstract etc.)

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
972. Parental stress response within a family context: Association with diabetic control in adolescents with IDDM	Full Text	Outcome: not related to insulin treatment adherence
973. Parent–child relationships and insulin-dependent diabetes mellitus: Observational ratings of clinically relevant dimensions	Full Text	Outcome: not related to insulin treatment adherence
974. Participant and parent experiences in the oral insulin study of the Diabetes Prevention Trial for Type 1 Diabetes	Abstract	Outcome: not related to insulin treatment adherence
976. Participant and parent experiences in the parenteral insulin arm of the diabetes prevention trial for type 1 diabetes	Abstract	Outcome: not related to insulin treatment adherence
978. Participant characteristics and study features associated with high retention rates in a longitudinal investigation of type 1 diabetes mellitus.	Title	Outcome: not related to insulin treatment adherence
979. Pathways from emotional adjustment to glycemic control in youths with diabetes in Hong Kong	Included	
980. Patient education and compliance in non-insulin dependent diabetes mellitus	Title	Population: do not have T1DM
981. Patient Perspectives on Nurse-led Consultations Within a Pilot Structured Transition Program for Young Adults Moving From an Academic Tertiary Setting to Community-based Type 1 Diabetes Care	Abstract	Outcome: not related to insulin treatment adherence
982. Patient perspectives on peer support for adults with type 1 diabetes: a need for diabetes-specific social capital.	Title	Population: not children (adults/foetuses)
983. Patient perspectives on personalized glucose advisory systems for type 1 diabetes management.	Abstract	Population: not children (adults/foetuses)

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
984. Patient recruitment in paediatric clinical trials	Title	Population: do not have T1DM
985. Patient safety and minimizing risk with insulin administration - role of insulin degludec.	Title	Outcome: not related to insulin treatment adherence
986. Patient with MSUD presenting with diabetic ketoacidosis	Title	Outcome: not related to insulin treatment adherence
987. Patients with poorly controlled diabetes in primary care: healthcare clinicians' beliefs and attitudes	Title	Outcome: not related to insulin treatment adherence
988. Patients' empowerment, physicians' perceptions, and achievement of therapeutic goals in patients with type 1 and type 2 diabetes mellitus in Mexico.	Abstract	Outcome: not related to insulin treatment adherence
989. Patterns of adherence to diabetes vision care guidelines: baseline findings from the Diabetic Retinopathy Awareness Program.	Title	Outcome: not related to insulin treatment adherence
990. Pediatric diabetes management in Appalachian Kentucky: adherence of primary care physicians to ADA guidelines	Title	Outcome: not related to insulin treatment adherence
992. Peptic ulcer disease in youths with insulin-dependent diabetes mellitus: a prospective study.	Title	Outcome: not related to insulin treatment adherence
993. Perceived peer support and diabetes management from adolescence into early emerging adulthood.	Full Text	Outcome: not related to insulin treatment adherence
994. Perceptions and experiences of using automated bolus advisors amongst people with type 1 diabetes: a longitudinal qualitative investigation.	Abstract	Outcome: not related to insulin treatment adherence
995. Percutaneous transhepatic pancreatic islet cell transplantation in type 1 diabetes mellitus: radiologic aspects.	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
996. Perfil clinico de ninos con cetoacidosis diabetica en una unidad de paciente criticoClinical profile of children with diabetic ketoacidosis in a critical care unit	Title	Outcome: not related to insulin treatment adherence
997. Persistent effects of a pedagogical device targeted at prevention of severe hypoglycaemia: a randomized, controlled study.	Abstract	Outcome: not related to insulin treatment adherence
998. Personal continuous glucose monitoring (CGM) in diabetes management: review of the literature and implementation for practical use.	Title	Outcome: not related to insulin treatment adherence
1000. Personality traits as predictors of adherence in adolescents with type I diabetes	Included	
1001. Personalized medicine switching from insulin to sulfonylurea in permanent neonatal diabetes mellitus dictated by a novel activating ABCC8 mutation	Title	Outcome: not related to insulin treatment adherence
1002. Perspectives of patients with type 1 or insulin-treated type 2 diabetes on self-monitoring of blood glucose: a qualitative study.	Title	Outcome: not related to insulin treatment adherence
1003. Pharmaceutical care of an adolescent with type 1 diabetes.	Abstract	Outcome: not related to insulin treatment adherence
1004. Pharmacokinetic Properties of Liraglutide as Adjunct to Insulin in Subjects with Type 1 Diabetes Mellitus.	Title	Outcome: not related to insulin treatment adherence
1005. Pharmazeutische Betreuung von Jugendlichen mit Diabetes mellitus Typ 1 Zeit fur "Diabetes Stewardship"?Diabetes Stewardship - Pharmaceutical care of adolescents with type 1 diabetes mellitus provided by community pharmacists	Full Text	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1006. Physical activity and sedentary behavior levels in children and adolescents with type 1 diabetes using insulin pump or injection therapy - The importance of parental activity profile.	Abstract	Outcome: not related to insulin treatment adherence
1007. Physical activity intensity and type 2 diabetes risk in overweight youth: A randomized trial	Title	Population: do not have T1DM
1008. Physical activity intensity and type 2 diabetes risk in overweight youth: The power trial, a randomized, controlled trial	Title	Population: do not have T1DM
1009. Pilot study of self-measurement of blood glucose using the Dextrostix-Eyetone system for juvenile-onset diabetes.	Title	Outcome: not related to insulin treatment adherence
1010. Polymer-Based Nanoparticle Strategies for Insulin Delivery.	Abstract	Outcome: not related to insulin treatment adherence
1011. Poor adherence in adolescents with type 1 diabetes associated with distress, fear of hypoglycemia, and executive functioning	Abstract	Wrong study type (review, conference abstract etc.)
1012. Poor adherence to integral daily tasks limits the efficacy of CSII in youth	Included	
1014. Poor home compliance in brittle diabetes	Abstract	Outcome: not related to insulin treatment adherence
1015. Post-Graduate education program for dieticians - Medical nutrition therapy in diabetes	Title	Outcome: not related to insulin treatment adherence
1016. Post-transplant diabetes mellitus (PTDM) in pediatric renal transplant recipient	Title	Population: do not have T1DM
1017. Postpartum physiology, psychology and paediatric study-P4 study	Title	Population: do not have T1DM
1018. Potential beneficial effects of a gluten-free diet in newly diagnosed children with type 1 diabetes: a pilot study.	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1019. Potential reno-protective effects of a gluten-free diet in type 1 diabetes.	Title	Outcome: not related to insulin treatment adherence
1020. Precipitating factors of diabetic ketoacidosis at a public hospital in a middle-income country.	Title	Outcome: not related to insulin treatment adherence
1022. Predicting adolescent adjustment to diabetes mellitus from locus of control and optimism	Abstract	Wrong study type (review, conference abstract etc.)
1023. Predictors and treatment outcome of hyperglycemic emergencies at Jimma University Specialized Hospital, southwest Ethiopia	Title	Outcome: not related to insulin treatment adherence
1025. Predictors of deteriorations in diabetes management and control in adolescents with type 1 diabetes.	Title	Outcome: not related to insulin treatment adherence
1026. Predictors of glucose control in children and adolescents with type 1 diabetes: results of a cross-sectional study in Cameroon	Title	Outcome: not related to insulin treatment adherence
1027. Predictors of glycemic control and diabetes-related costs among type 2 diabetes patients initiating therapy with liraglutide in the United States.	Title	Population: do not have T1DM
1028. Predictors of good adherence of adolescents with diabetes (insulin-dependent diabetes mellitus)	Included	
1029. Predictors of metabolic control at one year in a population of pediatric patients with type 2 diabetes mellitus: A retrospective study	Title	Population: do not have T1DM
1030. Predictors of parental monitoring of diabetes care in a high-risk sample	Abstract	Wrong study type (review, conference abstract etc.)
1031. Predictors of response to insulin therapy in youth with poorly-controlled type 2 diabetes in the TODAY trial	Title	Population: do not have T1DM

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1032. Predictors of study completion and withdrawal in a randomized clinical trial of a pediatric diabetes adherence intervention.	Title	Outcome: not related to insulin treatment adherence
1033. Preprandial versus postprandial blood glucose monitoring in type 1 diabetic pregnancy: a randomized controlled clinical trial.	Title	Outcome: not related to insulin treatment adherence
1034. Presente e futuro della terapia insulinica nel bambino e adolescente con diabete mellito di tipo 1Insulin therapy in children and adolescents with T1DM - What's here and what's to come	Full Text	Wrong study type (review, conference abstract etc.)
1035. Prevalence and management of patients with type 1 diabetes and autism spectrum disorder	Abstract	Wrong study type (review, conference abstract etc.)
1036. Prevalence of diabetic eye disease in an inner city population: The Liverpool Diabetic Eye Study	Title	Outcome: not related to insulin treatment adherence
1037. Prevalence of endocrine complications and short stature in patients with thalassaemia major: A multicenter study by the Thalassaemia International Federation (TIF)	Title	Population: do not have T1DM
1038. Prevalence of injection-meal interval usage and its association with variables of metabolic control in patients with Type 1 and Type 2 diabetes.	Abstract	Outcome: not related to insulin treatment adherence
1039. Prevalence of intentional under- and overdosing of insulin in children and adolescents with type 1 diabetes	Included	
1041. Prevalence of intentional under- and overdosing of insulin in diabetic children and adolescents		

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1042. Primary dietary intervention study to reduce the risk of islet autoimmunity in children at increased risk for type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
1043. Primary dietary intervention study to reduce the risk of islet autoimmunity in children at increased risk for type 1 diabetes: the BABYDIET study.	Title	Outcome: not related to insulin treatment adherence
1044. Problem solving and diabetes regimen adherence by children and adolescents with IDDM in social pressure situations: A reflection of normal development	Full Text	Outcome: not related to insulin treatment adherence
1045. Profile of internection of pediatric patients with diabetes mellitus type 1 in a reference service in Rio de Janeiro	Title	Outcome: not related to insulin treatment adherence
1046. Prolonged use of continuous glucose monitors in children with type 1 diabetes on continuous subcutaneous insulin infusion or intensive multiple-daily injection therapy.	Abstract	Outcome: not related to insulin treatment adherence
1047. Proposed clinical application for tuning fuzzy logic controller of artificial pancreas utilizing a personalization factor	Abstract	Outcome: not related to insulin treatment adherence
1048. Prospects for smoking cessation among people with insulin-dependent diabetes.	Title	Outcome: not related to insulin treatment adherence
1049. Protocol for Meal-time Administration of Exenatide for Glycaemic Control in Type 1 Diabetes Cases (The MAG1C trial): a randomised, double-blinded, placebo-controlled trial.	Title	Outcome: not related to insulin treatment adherence
1050. Psychiatric illness and family support in children and adolescents hospitalized with diabetic ketoacidosis	Abstract	Wrong study type (review, conference abstract etc.)

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1051. Psychiatric illness and family support in children and adolescents with diabetic ketoacidosis: A controlled study	Abstract	Outcome: not related to insulin treatment adherence
1052. Psycho-social aspects of children and adolescents with diabetes.	Abstract	Outcome: not related to insulin treatment adherence
1053. Psychoanalytic formulation and treatment: Chronic metabolic disturbance in insulin-dependent diabetes mellitus	Abstract	Wrong study type (review, conference abstract etc.)
1054. Psychologic predictors of compliance in children with recent onset of diabetes mellitus	Included	
1055. Psychological and demographic correlates of glycaemic control in adult patients with type 1 diabetes.	Title	Population: not children (adults/foetuses)
1057. Psychological aspects of childhood diabetes	Abstract	Outcome: not related to insulin treatment adherence
1058. Psychological aspects of continuous glucose monitoring in pediatric type 1 diabetes.	Title	Outcome: not related to insulin treatment adherence
1059. Psychological barriers to optimal insulin therapy: more concerns in adolescent females than males.	Full Text	Outcome: not related to insulin treatment adherence
1060. Psychological factors associated with diabetes self-management among adolescents with Type 1 diabetes: A systematic review	Title	Wrong study type (review, conference abstract etc.)
1061. Psychological functioning among mothers of children with insulin-dependent diabetes mellitus: A longitudinal study	Full Text	Outcome: not related to insulin treatment adherence
1062. Psychological impact of continuous subcutaneous insulin infusion pump therapy in non-selected newly diagnosed insulin dependent (type 1) diabetic children: evaluation after two years of therapy.	Included	

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1064. Psychological responses to the needle-free injection of insulin with the disposable front-end Medi-Jector (MJ-6)	Abstract	Wrong study type (review, conference abstract etc.)
1065. Psychometric analysis of the Spanish and Catalan versions of the Diabetes Self-Care inventory-revised version questionnaire.	Abstract	Population: not children (adults/foetuses)
1066. Psychometric evaluation of the adherence in diabetes questionnaire	Included	
1068. Psychometric properties of a diabetes resilience measure for adolescents	Abstract	Wrong study type (review, conference abstract etc.)
1069. Psychometric properties of the preschool diabetes behavior checklist	Abstract	Wrong study type (review, conference abstract etc.)
1070. Psychopathology and continuous subcutaneous insulin infusion in type 1 diabetes.	Abstract	Outcome: not related to insulin treatment adherence
1071. Psychosocial adaptation following the diagnosis of insulin-dependent diabetes mellitus: An intervention	Abstract	Outcome: not related to insulin treatment adherence
1072. Psychosocial and psychopathologic influences on management and control of insulin-dependent diabetes	Full Text	Population: not children (adults/foetuses)
1073. Psychosocial aspects of xenotransplantation: survey in adolescent recipients of porcine islet cells.	Title	Outcome: not related to insulin treatment adherence
1074. Psychosocial correlates of glycemic control: the Pittsburgh Epidemiology of Diabetes Complications (EDC) Study.	Title	Outcome: not related to insulin treatment adherence
1075. Psychosocial determinants of regimen adherence behaviors in adolescents with type I insulin-dependent diabetes mellitus: Individual cognitive factors, social factors, and perceived barriers to adherence	Abstract	Wrong study type (review, conference abstract etc.)

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1076. Psychosocial factors associated with use of continuous glucose monitoring.	Title	Outcome: not related to insulin treatment adherence
1077. Psychosocial predictors of adherence and metabolic control in adolescents with insulin-dependent diabetes mellitus	Abstract	Wrong study type (review, conference abstract etc.)
1078. Psychosocial problems in adolescents with type 1 diabetes mellitus.	Abstract	Wrong study type (review, conference abstract etc.)
1080. Psychosocial profile, glycemic control and well being in poverty associated type 1 diabetes mellitus [T1DM] adolescents in India	Abstract	Wrong study type (review, conference abstract etc.)
1081. Psyllium supplementation improves parameters of the metabolic syndrome: A randomized, participant-blinded, placebo controlled, crossover trial	Title	Population: do not have T1DM
1082. Puberty in CF	Title	Population: do not have T1DM
1083. Pulmonary function in insulin-dependent diabetes mellitus with limited joint mobility.	Title	Outcome: not related to insulin treatment adherence
1084. Pump settings in different age groups	Abstract	Wrong study type (review, conference abstract etc.)
1085. Pumpers, skypers, surfers and texters: Technology to improve the management of diabetes in teenagers	Abstract	Outcome: not related to insulin treatment adherence
1086. Quality of life and diabetes knowledge of young persons with type 1 diabetes: Influence of treatment modalities and demographics	Full Text	Outcome: not related to insulin treatment adherence
1088. Quality of life and glycemic control in adolescents with type 1 diabetes and the impact of an education intervention	Included	
1090. Quality of life and new devices in the management of type 1 diabetes in children and adolescents.	Abstract	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1091. Quality of life in children with diabetes and celiac disease: minimal impact of the 'double diagnosis'.	Abstract	Outcome: not related to insulin treatment adherence
1092. Quality of life in insulin users measured by ITR-QOL	Full Text	Population: not children (adults/foetuses)
1093. Quality of Life in Type 1 Diabetes and Celiac Disease: Role of the Gluten-Free Diet	Title	Outcome: not related to insulin treatment adherence
1094. Quality of life of children and adolescents with type 1 diabetes in Kuwait.	Included	
1095. Quality of life related to health in adolescents with type 1 diabetes	Abstract	Wrong study type (review, conference abstract etc.)
1096. Quality of life, perceived difficulties in adherence to a diabetes regimen, and blood glucose control.	Full Text	Population: not children (adults/foetuses)
1097. Quality of the parent-child interaction in young children with type 1 diabetes mellitus: study protocol.	Abstract	Outcome: not related to insulin treatment adherence
1098. Race and sex differences in metabolic control of adolescents with IDDM: A function of psychosocial variables?	Abstract	Outcome: not related to insulin treatment adherence
1099. Randomised placebo-controlled trial of human recombinant insulin-like growth factor I plus intensive insulin therapy in adolescents with insulin-dependent diabetes mellitus	Title	Outcome: not related to insulin treatment adherence
1100. Randomized, controlled trial of behavior therapy for families of adolescents with insulin-dependent diabetes mellitus	Abstract	Outcome: not related to insulin treatment adherence
1101. Rare, acute complications in children with diabetes mellitus type 1	Title	Outcome: not related to insulin treatment adherence
1102. Real world management of pregestational diabetes not achieving glycemic control for many patients in the UK	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1103. Real-time continuous glucose monitoring in children and adolescents	Title	Outcome: not related to insulin treatment adherence
1105. Reasons for the discontinuation of therapy of personal insulin pump in children with type 1 diabetes.	Abstract	Outcome: not related to insulin treatment adherence
1106. Recent challenges in insulin delivery systems: a review.	Title	Wrong study type (review, conference abstract etc.)
1107. Recent Updates on Novel Approaches in Insulin Drug Delivery: A Review of Challenges and Pharmaceutical Implications.	Title	Wrong study type (review, conference abstract etc.)
1108. Recommendations for the use of sensor-augmented pumps with predictive low-glucose suspend features in children: The importance of education.	Abstract	Outcome: not related to insulin treatment adherence
1109. Recurrent diabetic ketoacidosis-like symptoms and factitious hyperglycemia as a Munchausen syndrome in diabetes mellitus type 1: A case report	Title	Outcome: not related to insulin treatment adherence
1110. Recurrent Hypertriglyceridemic Pancreatitis (HTGP); and the Use of Insulin Drip as Treatment.	Title	Population: do not have T1DM
1111. Redesigning an intensive insulin service for patients with type 1 diabetes: a patient consultation exercise.	Abstract	Population: not children (adults/foetuses)
1112. Reduction in severe hypoglycaemia in paediatric type 1 diabetes during the first year of continuous glucose monitoring: Real-world data from the DPV registry	Title	Outcome: not related to insulin treatment adherence
1113. Reduction of protein intake decreases glomerular filtration rate in young type 1 (insulin-dependent) diabetic patients mainly in hyperfiltering patients.	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1114. Reemergence of a rare syndrome: Mauriac syndrome	Title	Outcome: not related to insulin treatment adherence
1115. Relation of different measures of psychological characteristics to oral health habits, diabetes adherence and related clinical variables among diabetic patients	Full Text	Population: not children (adults/foetuses)
1116. Relation of serum leptin and insulin-like growth factor-1 levels to intima-media thickness and functions of common carotid artery in children and adolescents with type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
1118. Relationship between age at menarche and cardiovascular risk factors in women with type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
1119. Relationship between blood glucose levels and manic episodes in a patient with bipolar-I disorder: Presentation of a case	Title	Population: do not have T1DM
1120. Relationship between disinhibition and metabolic control in adolescents with type 1 diabetes	Abstract	Outcome: not related to insulin treatment adherence
1121. Relationship between food consumption and glycemic control of adolescents with type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
1122. Relationship between glycemic control, ethnicity and socioeconomic status in Hispanic and white non-Hispanic youths with type 1 diabetes mellitus.	Abstract	Outcome: not related to insulin treatment adherence
1123. Relationship between health locus of control, health value, and social support and compliance of persons with diabetes mellitus.	Full Text	Population: not children (adults/foetuses)
1124. Relationship of self-efficacy and binging to adherence to diabetes regimen among adolescents	Included	

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1125. Relationship of the patient age and intensity of type 2 diabetes treatment	Title	Population: do not have T1DM
1126. Relationships between goals and health outcomes in children and adolescents with insulin-dependent diabetes mellitus	Abstract	Outcome: not related to insulin treatment adherence
1127. Relationships between quality of life, family factors, adherence, and glycemic control in pediatric patients with Type 1 diabetes mellitus	Abstract	Wrong study type (review, conference abstract etc.)
1128. Reliability of reporting of self-monitoring of blood glucose in pregnant women.	Title	Population: do not have T1DM
1129. Research on social support in adolescents with IDDM: a critical review	Title	Wrong study type (review, conference abstract etc.)
1130. Response to comment on Gomes et al. Adherence to insulin therapeutic regimens in patients with type 1 diabetes. A nationwide survey in Brazil. Diabetes Res Clin Pract. 2016;120:47-55.	Full Text	Wrong study type (review, conference abstract etc.)
1131. Responsibility for the type 1 diabetes regimen and fear of hypoglycemia in adolescents who use insulin pumps and their parents	Abstract	Outcome: not related to insulin treatment adherence
1132. Reversal of type 2 diabetes in youth who adhere to a very-low-energy diet: a pilot study	Title	Population: do not have T1DM
1133. Reversible steatohepatosis in a young boy with brittle type 1 diabetes mellitus: Mauriac syndrome	Title	Outcome: not related to insulin treatment adherence
1135. Review and update of insulin dependent diabetes mellitus.	Title	Wrong study type (review, conference abstract etc.)
1136. Review of genetic diabetes in an irish paediatric diabetes centre	Title	Population: do not have T1DM
1137. Revisit of a rare complication of type 1 diabetes mellitus: Mauriac syndrome	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1138. Rhino-orbital-cerebral mucormycosis: a lethal complication of body dysmorphic disorder.	Title	Population: do not have T1DM
1139. Rising incidence and challenges of childhood diabetes. A mini review.	Title	Wrong study type (review, conference abstract etc.)
1141. Risk factors and predictors of uncontrolled hyperglycemia and diabetic ketoacidosis in children and adolescents with type 1 diabetes mellitus in Jeddah, western Saudi Arabia	Abstract	Outcome: not related to insulin treatment adherence
1143. Risk factors for poor glycemic control in diabetic children in France.	Included	
1144. Risk factors for poor glycemic control in diabetic children in France: Immigrant versus nonimmigrant mothers		
1145. Risk factors for recurrent admissions with diabetic ketoacidosis: a case-control observational study.	Abstract	Outcome: not related to insulin treatment adherence
1146. Risk Factors for Recurrent Diabetic Ketoacidosis in Adults With Type 1 Diabetes.	Title	Population: not children (adults/foetuses)
1147. Risk factors of eating disorders in adolescents with type 1 diabetes	Abstract	Wrong study type (review, conference abstract etc.)
1148. Risk factors of recurrent diabetic ketoacidosis among type 1 diabetes mellitus children in Dr. Hasan Sadikin General Hospital	Abstract	Outcome: not related to insulin treatment adherence
1149. Role of Social Factors in Glycemic Control Among African American Children and Adolescents with Type 1 Diabetes.	Abstract	Outcome: not related to insulin treatment adherence
1150. Root cause analysis of diabetic ketoacidosis and its complications: A developing country experience	Abstract	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1151. Salient characteristics of youth with type 1 diabetes initiating continuous glucose monitoring	Title	Outcome: not related to insulin treatment adherence
1153. Satisfaction and quality of life with premeal inhaled versus injected insulin in adolescents and adults with type 1 diabetes	Included	
1155. School adherence with guidelines for children with diabetes	Abstract	Outcome: not related to insulin treatment adherence
1156. Screening for diabetes mellitus in patients with a history of gestational diabetes mellitus: A comparison of practice patterns and adherence to the recommended guidelines in community teaching hospitals	Title	Population: do not have T1DM
1157. Self-administered diabetes self-management profile-short form (DSMP-SF): A user-friendly adherence screener for youth with T1D	Abstract	Outcome: not related to insulin treatment adherence
1158. Self-care behaviors and glycemic control in type I diabetes.	Abstract	Outcome: not related to insulin treatment adherence
1159. Self-care behaviors in insulin-dependent diabetes: Evaluative tools and their associations with glycemic control	Abstract	Outcome: not related to insulin treatment adherence
1160. Self-care behaviour, treatment satisfaction and quality of life in people on intensive insulin treatment.	Abstract	Outcome: not related to insulin treatment adherence
1161. Self-disclosure and peer support in adolescents with insulin-dependent diabetes mellitus	Abstract	Outcome: not related to insulin treatment adherence
1162. Self-efficacy as a common variable in oral health behavior and diabetes adherence	Full Text	Population: not children (adults/foetuses)

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1163. Self-efficacy as a mediator variable for adolescents' adherence to treatment for insulin-dependent diabetes mellitus	Included	
1164. Self-efficacy scale for Brazilians with type 1 diabetes.	Abstract	Outcome: not related to insulin treatment adherence
1165. Self-esteem as a characteristic of adherence to diabetes and dental self-care regimens	Full Text	Population: not children (adults/foetuses)
1166. Self-Management Behaviors in Adults on Insulin Pump Therapy.	Title	Population: not children (adults/foetuses)
1167. Self-monitored blood glucose: a common pitfall.	Title	Outcome: not related to insulin treatment adherence
1168. Self-monitoring adherence to physical activity in children and adolescents with type 1 diabetes.	Title	Outcome: not related to insulin treatment adherence
1170. Self-monitoring of blood glucose (SMBG) in youth with poorly controlled type 2 diabetes (T2D) in the today study	Title	Population: do not have T1DM
1171. Self-monitoring of blood glucose among patients with diabetes in Jordan: Perception, adherence, and influential factors	Title	Outcome: not related to insulin treatment adherence
1172. Self-monitoring of blood glucose and insulin dose alteration in type 1 diabetes mellitus	Full Text	Population: not children (adults/foetuses)
1174. Self-monitoring of blood glucose in youth-onset type 2 diabetes: Results from the ToDay study	Title	Population: do not have T1DM
1175. Self-monitoring of blood glucose levels and glycemic control: the Northern California Kaiser Permanente Diabetes registry.	Title	Outcome: not related to insulin treatment adherence
1176. Self-reported compliance with diabetes self-management during pregnancy.	Abstract	Population: not children (adults/foetuses)

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1177. Sensor augmented pump therapy from onset of type 1 diabetes: Late follow-up results of the Pediatric ONSET Study	Abstract	Outcome: not related to insulin treatment adherence
1178. Sensor-augmented insulin pump therapy: results of the first randomized treat-to-target study.	Abstract	Outcome: not related to insulin treatment adherence
1179. Sensor-augmented pump and multiple daily injection therapy in the United States and Canada: post-hoc analysis of a randomized controlled trial.	Abstract	Population: not children (adults/foetuses)
1180. Sertraline induced acute pancreatitis in a diabetic adolescent?	Title	Outcome: not related to insulin treatment adherence
1181. Serum C-peptide assay of patients with hyperglycemic emergencies at the Lagos State University Teaching Hospital (LASUTH), Ikeja	Title	Outcome: not related to insulin treatment adherence
1182. Severe diabetic papillopathy mimicking non-arteritic anterior ischemic optic neuropathy (NAION) in a young patient.	Title	Outcome: not related to insulin treatment adherence
1183. Severe Growth Failure and Poorly Controlled Type 1 Diabetes Mellitus in a 7-Year-Old Girl: Mauriac Syndrome.	Title	Outcome: not related to insulin treatment adherence
1184. Severe hypertriglyceridemia in 3 adolescents with type 2 diabetes mellitus and all treated with l-asparaginase	Title	Population: do not have T1DM
1185. Severe hypoglycemia in IDDM children	Abstract	Outcome: not related to insulin treatment adherence
1186. Shared decision making between adolescents with type 1 diabetes and physicians	Abstract	Wrong study type (review, conference abstract etc.)
1187. Short-term effects of a low carbohydrate diet on glycaemic variables and cardiovascular risk markers in patients with type 1 diabetes: A randomized open-label crossover trial.	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1188. Should we mix lispro with glargine? removing the guesswork by euglycemic clamp studies	Title	Outcome: not related to insulin treatment adherence
1189. Simulation of diabetic eye disease to compare screening policies.	Title	Outcome: not related to insulin treatment adherence
1190. Simultaneous vs delayed initiation of Real-Time Continuous Glucose Monitoring (RT-CGM) in children and adolescents with established type 1 diabetes starting insulin pump therapy: A pilot study	Abstract	Outcome: not related to insulin treatment adherence
1191. Situational obstacles to adherence for adolescents with diabetes	Abstract	Outcome: not related to insulin treatment adherence
1192. Six months of gluten-free diet do not influence autoantibody titers, but improve insulin secretion in subjects at high risk for type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
1194. Six months of gluten-free diet lowers insulin requirement but does not influence residual betacell capacity in children with recent T1D onset	Title	Outcome: not related to insulin treatment adherence
1195. Sleep duration and its impact on adherence in adolescents with type 1 diabetes mellitus	Included	
1197. Sleep in children with type 1 diabetes and their parents in the T1D Exchange	Abstract	Outcome: not related to insulin treatment adherence
1198. Sleepovers and diabetic ketoacidosis: A cross sectional chart review of DKA admissions in established patients with type 1 diabetes	Abstract	Wrong study type (review, conference abstract etc.)
1199. Social competence and parental support as mediators of the link between stress and metabolic control in adolescents with insulin-dependent diabetes mellitus	Included	

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1200. Social learning intervention to promote metabolic control in type I diabetes mellitus: pilot experiment results.	Full Text	Outcome: not related to insulin treatment adherence
1201. Socio-economic, demographic, and clinical correlates of poor glycaemic control within insulin regimens among children with Type 1 diabetes: the SEARCH for Diabetes in Youth Study	Abstract	Outcome: not related to insulin treatment adherence
1202. Sociodemographic and psychosocial factors associated with continuous subcutaneous insulin infusion in adolescents with type 1 diabetes.	Abstract	Outcome: not related to insulin treatment adherence
1203. Sponsorship for adolescents with diabetes	Title	Outcome: not related to insulin treatment adherence
1204. Spontaneous complete remission of type 1 diabetes mellitus in an adult - review and case report.	Title	Population: not children (adults/foetuses)
1205. Stabilization of glycemic control and improved quality of life using a shared medical appointment model in adolescents with type 1 diabetes in suboptimal control.	Included	
1206. Strategies to improve insulin adherence in adolescents with type 1 diabetes	Full Text	Outcome: not related to insulin treatment adherence
1208. Strengths, risk factors, and resilient outcomes in adolescents with type 1 diabetes (T1D): Results from diabetes MILES Youth-Australia	Abstract	Outcome: not related to insulin treatment adherence
1209. Stressful Life Events in Young Adults With Type 1 Diabetes in the U.S. T1D Exchange Clinic Registry	Title	Population: not children (adults/foetuses)
1210. Study medication adherence and outcomes in the TODAY cohort of youth with type 2 diabetes (T2D)	Title	Population: do not have T1DM

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1211. Study on pregnancy outcomes in patients with prepubertal onset of type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
1212. Subcutaneous rapid-acting insulin analogues for diabetic ketoacidosis	Title	Outcome: not related to insulin treatment adherence
1214. Successful switching of multiple dose insulin to oral agents after mixedmeal tolerance test in patient with childhood-onset diabetes	Abstract	Outcome: not related to insulin treatment adherence
1215. Sulfonylurea treatment in a celiac girl with neonatal diabetes (KCNJ11 R201H): Impact of low compliance to the gluten free diet	Title	Outcome: not related to insulin treatment adherence
1216. Support as a crucial predictor of good compliance of adolescents with a chronic disease	Full Text	Outcome: not related to insulin treatment adherence
1217. Supported telemonitoring and glycemic control in people with type 2 diabetes : the Telescot diabetes pragmatic multicenter randomized controlled trial.	Title	Population: do not have T1DM
1218. Supportive and nonsupportive family behaviors: relationships to adherence and metabolic control in persons with type I diabetes.	Full Text	Outcome: not related to insulin treatment adherence
1219. Surreptitious insulin overdosing in adolescents with type 1 diabetes.	Included	
1220. Survey of antiobesity drug prescribing for obese children and young people in UK primary care	Title	Population: do not have T1DM
1221. Survey of insulin site rotation in youth with type 1 diabetes mellitus.	Included	
1222. Sustained CGM use in low income youth following insurance coverage	Title	Outcome: not related to insulin treatment adherence
1223. SWEET: Developing centers of excellence (CoR)	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1224. Systematic desensitization in the treatment of needle phobias for children with diabetes	Full Text	Wrong study type (review, conference abstract etc.)
1225. Systematic Review of the Cost Effectiveness of Insulin Analogues in Type 1 and Type 2 Diabetes Mellitus.	Title	Outcome: not related to insulin treatment adherence
1226. Tamoxifen suppresses pancreatic ß-cell proliferation in mice.	Title	Population: not humans
1227. Targeting optimal metabolic parameters in type 1 diabetes mellitus and coeliac disease: An extra challenge	Title	Outcome: not related to insulin treatment adherence
1228. Teaching children with diabetes about adequate dietary choices	Title	Outcome: not related to insulin treatment adherence
1230. Technical determinants of diabetes control in insulin pump therapy in children and adolescents	Abstract	Outcome: not related to insulin treatment adherence
1231. Teen power: Group intervention for poorly adherent teens with insulin-treated diabetes mellitus and their families	Abstract	Wrong study type (review, conference abstract etc.)
1232. Teenagers with diabetes--management challenges	Abstract	Outcome: not related to insulin treatment adherence
1234. Telemedicine and type 1 diabetes: is technology per se sufficient to improve glycaemic control?	Abstract	Outcome: not related to insulin treatment adherence
1235. Ten years' evaluation of diet, anthropometry, and physical exercise adherence after islet allotransplantation.	Title	Outcome: not related to insulin treatment adherence
1236. Tender hepatomegaly and abnormal pattern of hepatic steatosis in non-compliant adolescents with poorly controlled type 1 diabetes mellitus	Abstract	Outcome: not related to insulin treatment adherence
1237. The 600-step program for type 1 diabetes self-management in youth: the magnitude of the self-management task.	Full Text	Wrong study type (review, conference abstract etc.)

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1239. The advantages of bolus advisor for automatic calculation of preprandial insulin requirements in patients with type 1 diabetes	Abstract	Wrong study type (review, conference abstract etc.)
1240. The Audit of Diabetes-Dependent Quality of Life 19 (ADDQoL): feasibility, reliability and validity in a population-based sample of Australian adults	Title	Population: not children (adults/foetuses)
1241. The barriers against initiating insulin therapy among patients with diabetes living in Yazd, Iran	Title	Outcome: not related to insulin treatment adherence
1242. The basal to total insulin ratio in outpatients with diabetes on basal-bolus regimen.	Title	Outcome: not related to insulin treatment adherence
1243. The burden of severe hypoglycemia in type 1 diabetes.	Abstract	Outcome: not related to insulin treatment adherence
1244. The challenging years: Surviving adolescence	Abstract	Wrong study type (review, conference abstract etc.)
1245. The Choice Should Be Yours: Diabetes-Related Distress by Insulin Delivery Method for People with Type 1 Diabetes.	Abstract	Population: not children (adults/foetuses)
1246. The contribution of art therapy in poorly controlled youth with type 1 diabetes mellitus	Abstract	Outcome: not related to insulin treatment adherence
1248. The contribution of hope and affectivity to diabetes-related disability: An exploratory study	Title	Outcome: not related to insulin treatment adherence
1249. The course of glucose intolerance in children with cystic fibrosis: a retrospective study - preliminary report	Title	Population: do not have T1DM
1250. The current status of treatment-related severe hypoglycemia in Japanese patients with diabetes mellitus: a report from the committee on a survey of severe hypoglycemia in the Japan Diabetes Society.	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1251. The daily (Daily Automated Intensive Log for Youth) trial: A wireless, portable system to improve adherence and glycemic control in youth with diabetes	Abstract	Outcome: not related to insulin treatment adherence
1252. The Diabetes Social Support Questionnaire-Family Version: Evaluating adolescents' diabetes-specific support from family members	Included	
1254. The diabetic ketoacidosis	Title	Outcome: not related to insulin treatment adherence
1255. The diet in children with diabetes mellitus (DM)	Title	Outcome: not related to insulin treatment adherence
1256. The Effect of Family-centered Care on Management of Blood Glucose Levels in Adolescents with Diabetes.	Included	
1257. The effect of limited and strategic blood glucose monitoring on metabolic control in an indian type 1 diabetes clinic	Title	Outcome: not related to insulin treatment adherence
1258. The effect of metformin in overweight patients with type 1 diabetes and poor metabolic control.	Title	Outcome: not related to insulin treatment adherence
1259. The effect of nutritional status on the endocrine system: Endocrinologist's role in approaching malnutrition in young adults with cystic fibrosis	Title	Population: do not have T1DM
1260. The effect of peer support in adults with insulin pump-treated type 1 diabetes: a pilot study of a flexible and participatory intervention.	Title	Population: not children (adults/foetuses)
1261. The effect of the Talking Diabetes consulting skills intervention on glycaemic control and quality of life in children with type 1 diabetes: Cluster randomised controlled trial (DEPICTED study)	Full Text	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1263. The effect of whole body vibration training on insulin sensitivity in overweight adolescents: A randomized controlled trial	Title	Population: do not have T1DM
1264. The effectiveness of a daily practice clinical weight management program on cardiometabolic risk in obese children	Title	Population: do not have T1DM
1265. The effectiveness of Internet-based blood glucose monitoring system on improving diabetes control in adolescents with type 1 diabetes.	Abstract	Outcome: not related to insulin treatment adherence
1266. The Effects of Mental Stress on Non-insulin-dependent Diabetes: Determining the Relationship Between Catecholamine and Adrenergic Signals from Stress, Anxiety, and Depression on the Physiological Changes in the Pancreatic Hormone Secretion.	Title	Population: do not have T1DM
1267. The effects of parent education on adherence and metabolic control of children with insulin-dependent diabetes mellitus	Abstract	Wrong study type (review, conference abstract etc.)
1268. The effects of psychosocial factors on control and compliance with diabetes treatment regimens in a sample of children with insulin-dependent diabetes mellitus	Abstract	Wrong study type (review, conference abstract etc.)
1269. The effects of targeting improvements in urine glucose on metabolic control in children with insulin dependent diabetes	Title	Outcome: not related to insulin treatment adherence
1270. The effects of weight status on treatment outcomes in a randomized clinical trial of multisystemic therapy for adolescents with type 1 diabetes and chronically poor metabolic control	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1272. The efficacy and safety of growth hormone (GH) treatment used for children born small for gestational age (SGA) between 1991-2011: The experience of a regional centre	Title	Population: do not have T1DM
1273. The efficacy of intensive individual play therapy for children diagnosed with insulin-dependent diabetes mellitus	Abstract	Wrong study type (review, conference abstract etc.)
1274. The efficacy of intensive individual play therapy for chronically ill children	Included	
1275. The efficiency of telemedicine to optimize metabolic control in patients with type 1 diabetes mellitus: Telemed study.	Abstract	Population: not children (adults/foetuses)
1276. The egg or the chicken? Further data on whether good compliance to multi-injection insulin therapy should be a criterion for insulin pump therapy, or does insulin pump therapy improve compliance?	Abstract	Wrong study type (review, conference abstract etc.)
1277. The egg or the chicken? Should good compliance to multi-injection insulin therapy be a criterion for insulin pump therapy, or does insulin pump therapy improve compliance?	Abstract	Wrong study type (review, conference abstract etc.)
1278. The establishment of a new national network leads to quality improvement in childhood diabetes: Implementation of the ISPAD Guidelines	Title	Outcome: not related to insulin treatment adherence
1280. The feasibility of peer mentoring to improve adherence in adolescents and young adults with type 1 diabetes	Abstract	Outcome: not related to insulin treatment adherence
1281. The focus is on the families: Racial differences in parents' perception of diabetes care	Abstract	Wrong study type (review, conference abstract etc.)

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1282. The health and lifestyles of adolescents with type 1 diabetes in Portugal	Abstract	Outcome: not related to insulin treatment adherence
1283. The health belief model and adolescents with insulin-dependent diabetes mellitus	Included	
1284. The impact of adherence to the nutritional education on glycemic control and quality of life in children and adolescents with type 1 diabetes mellitus	Title	Outcome: not related to insulin treatment adherence
1285. The impact of ethnicity, educational and economic status on the prescription of insulin therapeutic regimens and on glycemic control in patients with type 1 diabetes. A nationwide study in Brazil.	Title	Outcome: not related to insulin treatment adherence
1286. The impact of family functioning on treatment adherence and metabolic control for adolescents with poorly controlled type 1 diabetes	Abstract	Wrong study type (review, conference abstract etc.)
1287. The impact of insulin glargine on clinical and humanistic outcomes in patients uncontrolled on other insulin and oral agents: an office-based naturalistic study.	Title	Outcome: not related to insulin treatment adherence
1288. The impact of mothers' sense of empowerment on the metabolic control of their children with juvenile diabetes	Included	
1289. The Impact of Patient-Centered Medical Homes on Quality of Care and Medication Adherence in Patients with Diabetes Mellitus	Abstract	Outcome: not related to insulin treatment adherence
1290. The impact of physiological, therapeutic and psychosocial variables on glycemic control in youth with type 1 diabetes mellitus	Abstract	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1292. The Impact of Self-Monitoring Blood Glucose Adherence On Glycemic Goal Attainment in an Indigent Population, With Pharmacy Assistance.	Title	Outcome: not related to insulin treatment adherence
1293. The impact of sensor-augmented insulin pump (SAP) therapy on quality of life (QOL) in children and adolescents with type 1 diabetes (T1D) and their parents	Abstract	Wrong study type (review, conference abstract etc.)
1294. The impact of sleep on adherence behaviors in adolescents with type 1 diabetes mellitus	Abstract	Wrong study type (review, conference abstract etc.)
1295. The Impact of Technology on Current Diabetes Management.	Abstract	Outcome: not related to insulin treatment adherence
1297. The influence of patient variables on insulin total daily dose in paediatric inpatients with new onset type 1 diabetes mellitus.	Title	Outcome: not related to insulin treatment adherence
1298. The influence of process, structure and policy on HbA1c levels in treatment of children and adolescents with type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
1301. The Interactive Effect of Diabetes Family Conflict and Depression on Insulin Bolusing Behaviors for Youth	Included	
1302. The International Diabetes Closed-Loop Study: Testing Artificial Pancreas Component Interoperability	Title	Outcome: not related to insulin treatment adherence
1303. The International Xenotransplantation Association consensus statement on conditions for undertaking clinical trials of porcine islet products in type 1 diabetes--chapter 3: Pig islet product manufacturing and release testing.	Title	Population: not humans

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1304. The JDRF CCTN CGM TIME Trial: Timing of Initiation of continuous glucose Monitoring in Established pediatric type 1 diabetes: Study protocol, recruitment and baseline characteristics	Title	Outcome: not related to insulin treatment adherence
1306. The lived experiences of young people (13-16 years) with Type 1 diabetes mellitus and their parents--a qualitative phenomenological study.	Abstract	Outcome: not related to insulin treatment adherence
1307. The multinational second Diabetes, Attitudes, Wishes and Needs study: results of the French survey.	Abstract	Outcome: not related to insulin treatment adherence
1308. The natural history of brittle diabetes.	Abstract	Outcome: not related to insulin treatment adherence
1309. The onset of a chronic disease as a traumatic psychic experience: A psychodynamic survey on type 1 diabetes in young patients	Full Text	Outcome: not related to insulin treatment adherence
1310. The patient-doctor relationship and metabolic control in patients with type 1 (insulin-dependent) diabetes mellitus.	Abstract	Population: not children (adults/foetuses)
1311. The psychology of the adolescent with chronic disease: What to learn from the diabete	Abstract	Wrong study type (review, conference abstract etc.)
1312. The relationship among independence, diet adherence, and ego identity in adolescents with insulin-dependent diabetes mellitus	Title	Outcome: not related to insulin treatment adherence
1313. The relationship between adherence behaviors and metabolic control in childhood diabetes	Abstract	Outcome: not related to insulin treatment adherence
1314. The relationship between carbohydrate and the mealtime insulin dose in type 1 diabetes.	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1315. The relationship between diabetes self-management and metabolic control in youth with type 1 diabetes: an integrative review.	Title	Wrong study type (review, conference abstract etc.)
1316. The relationship between maternal fear of hypoglycaemia and adherence in children with type-1 diabetes.	Full Text	Outcome: not related to insulin treatment adherence
1317. The relationship between negative communication and body image dissatisfaction in adolescent females with type 1 diabetes mellitus	Included	
1319. The relationship between primary care physicians' adherence to guidelines for the treatment of diabetes and patient satisfaction : findings from a pilot study.	Abstract	Outcome: not related to insulin treatment adherence
1320. The relationship between psychological stress and insulin-dependent diabetic blood glucose control: preliminary investigations	Abstract	Population: not children (adults/foetuses)
1321. The Relationship between Self-Management and Glycemic Control in a Cohort of Children with Type 1 and Type 2 Diabetes.	Abstract	Outcome: not related to insulin treatment adherence
1322. The relationship of stress and coping to regimen adherence and glycemic control of diabetes	Abstract	Population: not children (adults/foetuses)
1323. The rise of technology in diabetes care. Not all that is new is necessarily better.	Abstract	Outcome: not related to insulin treatment adherence
1324. The role of coping with disease in adherence to treatment regimen and disease control in type 1 and insulin treated type 2 diabetes mellitus.	Abstract	Population: not children (adults/foetuses)

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1325. The role of diet behaviors in achieving improved glycemic control in intensively treated patients in the diabetes control and complications trial	Title	Outcome: not related to insulin treatment adherence
1326. The role of family environment and treatment adherence in the metabolic control of children with type 1 diabetes: A meta-analysis	Abstract	Wrong study type (review, conference abstract etc.)
1327. The role of health beliefs in the regimen adherence and metabolic control of adolescents and adults with diabetes mellitus	Included	
1328. The role of marital distress, parental and child depression, family functioning and health care behaviors in treatment adherence and metabolic control among adolescents with diabetes	Abstract	Wrong study type (review, conference abstract etc.)
1329. The Role of Peers for Diabetes Management in Adolescents and Emerging Adults With Type 1 Diabetes: A Longitudinal Study.	Full Text	Population: not children (adults/foetuses)
1330. The role of self-monitoring of blood glucose in the routine management of children with insulin-dependent diabetes mellitus	Title	Outcome: not related to insulin treatment adherence
1331. The screening and diagnosis of cystic fibrosis-related diabetes in the United Kingdom	Title	Population: do not have T1DM
1332. The self-regulation of health behavior in children with insulin-dependent diabetes mellitus	Abstract	Wrong study type (review, conference abstract etc.)
1333. The short-term results of intensive insulin therapy in preadolescent children with type-1 diabetes	Abstract	Outcome: not related to insulin treatment adherence
1334. The state of young adults with juvenile onset diabetes.	Title	Population: not children (adults/foetuses)

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1335. The structure of parental involvement and relations to disease management for youth with type 1 diabetes.	Included	
1336. The theory of reasoned action in describing tooth brushing, dental caries and diabetes adherence among diabetic patients	Full Text	Population: not children (adults/foetuses)
1337. The Type 1 Diabetes-Resistance Locus Idd22 Controls Trafficking of Autoreactive CTLs into the Pancreatic Islets of NOD Mice.	Title	Population: not humans
1338. The unusual presentation and challenges in managing thyroid storm with concominant diabetic ketoacidosis	Title	Outcome: not related to insulin treatment adherence
1339. The ups and downs of low-carbohydrate diets in the management of Type 1 diabetes: a review of clinical outcomes.	Title	Outcome: not related to insulin treatment adherence
1340. The use of a CoolSense device to lower pain sensation during finger pricking while measuring blood glucose in diabetes patients--a randomized placebo.	Abstract	Population: not children (adults/foetuses)
1341. The use of computers in the control of diabetes in children and adolescents.	Abstract	Wrong study type (review, conference abstract etc.)
1342. The use of insulin pump therapy in adolescents	Full Text	Outcome: not related to insulin treatment adherence
1343. The use of premixed 30/70 insulin in high risk youth with type 1 diabetes: A quality audit	Title	Outcome: not related to insulin treatment adherence
1344. The utility of natriuretic peptides as novel cardiovascular biomarkers in girls with Turner syndrome: Comparison of findings to obese children and adolescents	Title	Population: do not have T1DM
1345. There is a bright future in the management of diabetes in children in resource limited countries	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1346. Thyroiditis as a silent cause of hyperglycaemia in type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
1347. Tiempo de exposicion al gluten y marcadores de riesgo de diabetes mellitus insulino dependiente en pacientes celiacosRisk markers for insulin-dependent diabetes mellitus and duration of exposure to gluten in celiac patients	Title	Outcome: not related to insulin treatment adherence
1348. Time of Day When Type 1 Diabetes Patients With Eating Disorder Symptoms Most Commonly Restrict Insulin.	Abstract	Population: not children (adults/foetuses)
1349. Time to failure of oral therapy in children with type 2 diabetes: A single center retrospective chart review	Title	Population: do not have T1DM
1350. Timing of initiation of continuous glucose monitoring (CGM) in established pediatric diabetes (The CGM TIME trial)	Title	Outcome: not related to insulin treatment adherence
1351. Timing of Meal Insulin and Its Relation to Adherence to Therapy in Type 1 Diabetes	Abstract	Outcome: not related to insulin treatment adherence
1352. Tip 1 diyabetli cocuklarda glisemik kontrolu etkileyen faktorlerFactors influencing glycemic control in children with type 1 diabetes	Abstract	Outcome: not related to insulin treatment adherence
1353. To evaluate various precipitating factors for diabetic ketoacidosis	Abstract	Outcome: not related to insulin treatment adherence
1354. To study the clinical profile of children admitted with diabetic ketoacidosis in a Tertiary Hospital in India	Abstract	Outcome: not related to insulin treatment adherence
1355. To study the efficacy of intervention strategies on features of metabolic syndrome in asian urban adolescent girls with pcos	Title	Population: do not have T1DM

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1356. To whatsapp or not to whatsapp? what could be done with new social media to manage type 1 diabetes in adolescents	Abstract	Wrong study type (review, conference abstract etc.)
1357. Too sweet for too long?	Abstract	Population: do not have T1DM
1358. Total body irradiation (TBI) increases cardio-metabolic risk and induces carotid vascular stiffness in survivors after hematopoietic cell transplant (HCT) for childhood hematologic malignancies	Title	Population: do not have T1DM
1359. Transition instead of transfer for drug treatment in adolescent diabetes type 1	Title	Outcome: not related to insulin treatment adherence
1360. Translation and validation of the diabetes self-management profile (DSMP) in Brazilian Portuguese language: First instrument to access type 1 diabetes self-management in a Brazilian pediatric population	Abstract	Outcome: not related to insulin treatment adherence
1361. Treatment of osteopenia in children with insulin-dependent diabetes mellitus: The effect of 1alpha-hydroxyvitamin D3	Title	Outcome: not related to insulin treatment adherence
1362. Treatment of type 1 diabetes with insulin lispro during Ramadan.	Full Text	Population: not children (adults/foetuses)
1364. Treatment of type 2 diabetes in a Hispanic population of South Florida - Economic analysis	Title	Population: do not have T1DM
1365. Treatment of type 2 diabetes mellitus in children and adolescents	Title	Population: do not have T1DM
1366. Trends in cannabis use among patients with diabetes-the national survey on drug use and health, 2005-2017	Abstract	Outcome: not related to insulin treatment adherence
1367. Trends in cardiovascular risk factor management in type 1 diabetes by sex.	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1368. Trends in health-related quality of life among adolescents with type 1 diabetes mellitus in Saudi Arabia	Abstract	Wrong study type (review, conference abstract etc.)
1369. Twin studies in diabetes mellitus.	Title	Outcome: not related to insulin treatment adherence
1370. Two cases of diabetic ketoacidosis in HNF1A-MODY linked to severe dehydration: Is it time to change the diagnostic criteria for MODY?	Title	Population: do not have T1DM
1371. Type 1 diabetes among adolescents: Reduced diabetes self-care caused by social fear and fear of hypoglycemia	Included	
1373. Type 1 diabetes and prolonged fasting	Abstract	Outcome: not related to insulin treatment adherence
1375. Type 1 diabetes mellitus	Abstract	Wrong study type (review, conference abstract etc.)
1376. Type 1 diabetes mellitus and pregnancy.	Abstract	Outcome: not related to insulin treatment adherence
1377. Type 1 diabetes mellitus and sickle cell disease: A case series of pediatric patients at rainbow babies & children's hospital	Abstract	Outcome: not related to insulin treatment adherence
1378. Type 1 diabetes mellitus: Metabolic control before and after puberty	Abstract	Wrong study type (review, conference abstract etc.)
1379. Type 1 diabetes structured education: What are the core self-management behaviours?	Abstract	Outcome: not related to insulin treatment adherence
1380. Type 1 diabetes, sickle thalassemia in a toddler, case report in Saudi Arabia	Title	Outcome: not related to insulin treatment adherence
1381. Type 2 diabetes mellitus in children and adolescents.	Title	Population: do not have T1DM
1382. Type 2 diabetes mellitus is becoming the most common type of diabetes in school children	Title	Population: do not have T1DM
1383. Type I diabetes mellitus in toddlers	Abstract	Outcome: not related to insulin treatment adherence
1384. UCD School of Medicine and Medical Science, SMMS, Summer Student Research Awards 2013, SSRA	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1385. UK service level audit of insulin pump therapy in paediatrics.	Abstract	Outcome: not related to insulin treatment adherence
1386. Uncontrolled hypertension in type 1 diabetes: assessment of patients' desires about treatment and improvement of blood pressure control by a structured treatment and teaching programme.	Title	Outcome: not related to insulin treatment adherence
1388. Uncovering undetected hypoglycemic events.	Title	Outcome: not related to insulin treatment adherence
1389. Underestimated impact of non-severe nocturnal hypoglycaemic events (NHEs) on patients' functioning and well being	Title	Outcome: not related to insulin treatment adherence
1390. Understanding your diabetic patient.	Abstract	Outcome: not related to insulin treatment adherence
1391. Undiagnosed coeliac disease and risk of autoimmune disorders in subjects with type I diabetes mellitus	Title	Outcome: not related to insulin treatment adherence
1392. Unstable type 1 diabetes in adolescence	Abstract	Outcome: not related to insulin treatment adherence
1393. Updated and revised diabetes family conflict scale	Full Text	Outcome: not related to insulin treatment adherence
1395. Uptake of a novel tool to adjust insulin boluses, based on CGM trend arrows and insulin sensitivity (trend arrow adjustment tool); In children with type 1 diabetes, who are using insulin pump therapy and continuous glucose monitoring	Abstract	Wrong study type (review, conference abstract etc.)
1396. Urine alpha-Glutathione S-Transferase, systemic inflammation and arterial function in juvenile type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
1398. Use and discontinuation of continuous subcutaneous insulin infusion and continuous glucose monitoring in paediatric patients with type 1 diabetes: Rates and causes	Abstract	Wrong study type (review, conference abstract etc.)

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1399. Use of a glucose-controlled insulin infusion system in children and adolescents with insulin-dependent diabetes.	Full Text	Outcome: not related to insulin treatment adherence
1400. Use of an automated bolus calculator reduces fear of hypoglycemia and improves confidence in dosage accuracy in patients with type 1 diabetes mellitus treated with multiple daily insulin injections	Full Text	Outcome: not related to insulin treatment adherence
1402. Use of an insulin pen with memory is not enough to give better glycaemic control	Abstract	Outcome: not related to insulin treatment adherence
1403. Use of an integrated strip-free blood glucose monitoring system increases frequency of self-monitoring and improves glycemic control: Results from the ExAct study.	Title	Outcome: not related to insulin treatment adherence
1404. Use of Commonly Available Technologies for Diabetes Information and Self-Management Among Adolescents With Type 1 Diabetes and Their Parents: A Web-Based Survey Study.	Included	
1405. Use of continuous glucose monitoring, computerized therapy recommendations, and automated data processing in a pediatric trial of tight glycemic control	Abstract	Outcome: not related to insulin treatment adherence
1406. Use of continuous subcutaneous insulin infusion (insulin pump) therapy in the hospital: a review of one institution's experience.	Abstract	Outcome: not related to insulin treatment adherence
1407. Use of FGM as a clinical tool in type 1 diabetes young adults	Title	Outcome: not related to insulin treatment adherence
1408. Use of insulin pump therapy at nighttime only for children 7-10 years of age with type 1 diabetes	Abstract	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1410. Use of multisystemic therapy to improve regimen adherence among adolescents with type 1 diabetes in chronic poor metabolic control: a randomized controlled trial.	Abstract	Outcome: not related to insulin treatment adherence
1411. Use of nutrition therapy in the management of diabetes mellitus.	Title	Outcome: not related to insulin treatment adherence
1412. Use of the real-time continuous glucose monitor at initiation of insulin pump therapy in children and adolescents	Abstract	Outcome: not related to insulin treatment adherence
1413. Using a primary nurse manager to implement DCCT recommendations in a large pediatric program.	Title	Outcome: not related to insulin treatment adherence
1414. Using an injection port helps improve metabolic control and compliance to a strict basal-bolus regimen in children and adolescents with type 1 diabetes.	Full Text	Wrong study type (review, conference abstract etc.)
1415. Using behavioral interventions to assist children with type 1 diabetes manage blood glucose levels	Full Text	Outcome: not related to insulin treatment adherence
1416. Using gamification to encourage blood glucose testing in children with Type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
1417. Using insulin pump with a remote control system in patients with diabetes improves glyemic control and enhances patient satisfaction	Abstract	Outcome: not related to insulin treatment adherence
1418. Using mobile phones to measure adolescent diabetes adherence	Abstract	Outcome: not related to insulin treatment adherence
1420. Using spatio-temporal surveillance data to test the infectious environment of children before type 1 diabetes diagnosis.	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1421. Using the Internet-based upload blood glucose monitoring and therapy management system in patients with type 1 diabetes.	Title	Outcome: not related to insulin treatment adherence
1422. USO DI INSULINE PREMISCELATE NEL TRATTAMENTO DEL BAMBINO DIABETICOUse of premixed insulins in the management of children with type 1 diabetes	Title	Outcome: not related to insulin treatment adherence
1423. Vaccination adherence to influenza, pneumococcal and hepatitis B virus in adult type 1 diabetes mellitus patients.	Title	Population: not children (adults/foetuses)
1424. Validation of a contemporary adherence measure for children with Type 1 diabetes: The Diabetes Management Questionnaire	Abstract	Outcome: not related to insulin treatment adherence
1426. Validation of a diabetes self-care measure for parents of children with type 1 diabetes	Abstract	Outcome: not related to insulin treatment adherence
1427. Validation of a diabetes-specific quality-of-life scale for patients with type 1 diabetes.	Full Text	Population: not children (adults/foetuses)
1428. Validation of an abbreviated adherence measure in youth with type 1 diabetes (T1D)	Abstract	Wrong study type (review, conference abstract etc.)
1429. Validation of the diabetes self management profile-self report form: Measure of adolescent adherence	Abstract	Wrong study type (review, conference abstract etc.)
1430. Value of serum 1,5-anhydroglucitol measurements in childhood obesity in the continuum of diabetes	Title	Population: do not have T1DM
1431. Variations in the quality and sustainability of long-term glycaemic control with continuous subcutaneous insulin infusion.	Title	Outcome: not related to insulin treatment adherence
1432. Vessel wall properties of large arteries in uncomplicated IDDM	Title	Outcome: not related to insulin treatment adherence

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1433. Victimization of youth with type-1 diabetes by teachers: relations with adherence and metabolic control	Included	
1435. Virtual reality and interactive gaming technology for obese and diabetic children: is military medical technology applicable?	Abstract	Outcome: not related to insulin treatment adherence
1436. Visceral fat, independent of total-body adiposity, is associated with cardiovascular risk factors, insulin resistance, and vascular dysfunction among children and adolescents	Title	Population: do not have T1DM
1437. Web-based diabetes education and coping skills training	Abstract	Outcome: not related to insulin treatment adherence
1438. Weight gain associated with intensive therapy in the diabetes control and complications trial. The DCCT Research Group.	Full Text	Outcome: not related to insulin treatment adherence
1439. What do professionals recommend regarding the frequency of self-monitoring of blood glucose?	Title	Outcome: not related to insulin treatment adherence
1440. What's new in the psychosomatics of insulin-dependent diabetes mellitus	Abstract	Wrong study type (review, conference abstract etc.)
1441. When to treat a diabetic patient using an external insulin pump. Expert consensus. Société francophone du diabète (ex ALFEDIAM) 2009.	Title	Outcome: not related to insulin treatment adherence
1442. White Coat Adherence in Pediatric Patients with Type 1 Diabetes Who Use Insulin Pumps	Included	
1444. White Coat Adherence Occurs in Adolescents with Type 1 Diabetes Receiving Intervention to Improve Insulin Pump Adherence Behaviors		

Result Number and Title	Excluded by/included	First Exclusion Criteria Met
1445. Who participates in research on adherence to treatment in insulin-dependent diabetes mellitus? Implications and recommendations for research.	Abstract	Outcome: not related to insulin treatment adherence
1446. Wilson disease and metabolic syndrome: Is there a link?	Title	Population: do not have T1DM
1447. WITHDRAWN: Inhaled insulin in diabetes mellitus.	Abstract	Wrong study type (review, conference abstract etc.)
1448. Wolfram (DIDMOAD) syndrome: A multidisciplinary clinical study in nine Turkish patients and review of the literature	Title	Outcome: not related to insulin treatment adherence
1449. Wystepowanie celiakii oraz chorob autoimmunologicznych tarczycy u dzieci i mlodziey z cukrzyca typu 1 z regionu Dolnego SlaskaThe incidence celiac disease and autoimmune thyroid diseases in children and adolescents with diabetes type 1 from Lower Silesia	Title	Outcome: not related to insulin treatment adherence
1450. Yineleyen diyabetik ketoasidoz benzeri belirtiler ve yapay hiperglisemi, diyabet tip i ve munchausen sendromu birlikteligi: Olgu sunumuRecurrent diabetic ketoacidosis-like symptoms and factitious hyperglycemia as a munchausen syndrome in diabetes mellitus type 1: A case report	Title	Outcome: not related to insulin treatment adherence
1451. Young children's subjective reports about their diabetes mellitus: a validation of the Diabetes Pictorial Scale	Title	Outcome: not related to insulin treatment adherence
1452. Young patients with type 1 diabetes poorly controlled and poorly compliant with self-monitoring of blood glucose: can technology help? Results of the i-NewTrend randomized clinical trial	Title	Outcome: not related to insulin treatment adherence

Appendix 9 All studies found from database searching and if they were included or reasons for exclusion. Studies that have been left blank were either duplicates seen elsewhere in the table (often alternative language versions) or had been included as far as the full text screen but did not have a full text available.

Search Number	Database	Search Term	Number of Results
1	EMBASE	exp "INSULIN DEPENDENT DIABETES MELLITUS"/ OR exp "DIABETES MELLITUS"/	913 724
2	EMBASE	("type 1 diabetes").ti,ab	59 601
3	EMBASE	(1 OR 2)	916 691
4	EMBASE	(insulin).ti,ab	458 125
5	EMBASE	(3 AND 4)	201 771
6	EMBASE	(adherence).ti,ab	169 529
7	EMBASE	(compliance).ti,ab	175 573
8	EMBASE	(6 OR 7)	331 482
9	EMBASE	(5 AND 8)	4 406
10	EMBASE	9 [Human age groups Infant to one year OR Child unspecified age OR Preschool Child 1 to 6 years OR School Child 7 to 12 years OR Adolescent 13 to 17 years]	727
11	HMIC	exp "INSULIN DEPENDENT DIABETES MELLITUS"/ OR exp "DIABETES MELLITUS"/	2 892
12	HMIC	("type 1 diabetes").ti,ab	168
13	HMIC	(11 OR 12)	2 907
14	HMIC	(insulin).ti,ab	645
15	HMIC	(13 AND 14)	371
16	HMIC	(adherence).ti,ab	1 474

17	HMIC	(compliance).ti,ab	2 256
18	HMIC	(16 OR 17)	3 603
19	HMIC	(15 AND 18)	21
21	Medline	exp "DIABETES MELLITUS, TYPE 1"/	73 975
22	Medline	("type 1 diabetes").ti,ab	37 576
23	Medline	(21 OR 22)	85 036
24	Medline	(insulin).ti,ab	345 339
25	Medline	(23 AND 24)	34 757
26	Medline	(adherence).ti,ab	110 853
27	Medline	(compliance).ti,ab	109 996
28	Medline	(26 OR 27)	214 135
29	Medline	(25 AND 28)	711
50	Medline	29 [Human age groups Infant OR Child,preschool OR Child OR Adolescent]	342
31	PsycINFO	exp "DIABETES MELLITUS"/	8 102
32	PsycINFO	("type 1 diabetes").ti,ab	1 868
33	PsycINFO	(31 OR 32)	9 281
34	PsycINFO	(insulin).ti,ab	10 647
35	PsycINFO	(33 AND 34)	2 050
36	PsycINFO	(adherence).ti,ab	27 143
37	PsycINFO	(compliance).ti,ab	22 868
38	PsycINFO	(36 OR 37)	48 566
39	PsycINFO	(35 AND 38)	234
51	PsycINFO	39 [Human age groups Childhood birth-12 Yrs OR Neonatal birth-1 Mo OR Infancy 2-23 Mo OR Preschool Age	124

		2-5 Yrs OR School Age 6-12 Yrs OR Adolescence 13-17 Yrs]	
41	PubMed	("type 1 diabetes" OR "insulin dependent diabetes" OR "juvenile onset diabetes").ti,ab	38 798
42	PubMed	("type 1 diabetes").ti,ab	38 519
43	PubMed	(41 OR 42)	39 798
44	PubMed	(insulin).ti,ab	404 899
45	PubMed	(43 AND 44)	17 502
46	PubMed	(adherence).ti,ab	152 775
47	PubMed	(compliance).ti,ab	178 118
48	PubMed	(46 OR 47)	288 448
49	PubMed	(45 AND 48)	599

Appendix 10: Full search strategy used during systematic review. Legend; EMBASE: Excerpta Medica Database, HMIC: Healthcare Management Information Consortium, exp: explode – used within search engine to include the term as well as any more specific terms associated with it.

PENDANT study

A study to establish if there is a relationship between how unwell children and young people are when diagnosed with Type 1 Diabetes, and how well they manage later on

Information leaflet for younger participants

What is this about?

We want to get you and your family's help. We don't yet understand how much your new condition (Diabetes) has changed your life. Or how it has changed your family's life. We want to ask some questions to learn about this.

Why you?

You have recently found out that you have Type 1 Diabetes, and will be followed up by the team at Alder Hey.

What will the study involve?

We would like to ask you and your family some questions about how you are all feeling. These questions will take about 40 minutes, which is about the length of a lesson in school.

What will happen next?

We will ask you and your family (if they are present) to agree to take part (consent). If you are happy to do this, then we will ask the questions. If you want to take part, but can't today, we could phone your family up another time.

What will happen to the information collected about me?

The information will help us learn more about how well children and families can manage after a child (like you) has been told they have diabetes. The information collected will be stored at the hospital for 10 years.

Do I have to take part?

No. If you are not happy then your doctor will keep looking after you as normal. If you are not sure, we can arrange for someone to talk to you and answer any questions you have.

Can I change my mind?

Yes, this is not a problem. Just tell the nurse or doctor.

Who is doing this research?

Doctors at Alder Hey, and scientists at the University of Liverpool. Part of the study is being done by a medical student from the University of Liverpool, who has taken an extra year in their studies to do the research. The student is also based here at Alder Hey and is supported closely by the doctors and scientists.

Who do I ask about this?

Your family will have been given lots of information. If you or they are not sure, the doctor or nurse who gave you this information leaflet can tell you more

Appendix 11 Participant Information Sheet (PIS) for younger participants.

PENDANT study

A study to establish if there is a relationship between how unwell children and young people are when diagnosed with Type 1 Diabetes, and how well they manage later on

Information leaflet for older participants

What is this about?

We would like to invite you and your family to take part in our research study, to help understand the effects on patients and families of a new diagnosis of Type 1 Diabetes. This leaflet will help you to understand why the research is being done, and what it will involve.

Our team will go through this information with you and answer any questions you may have.

What do we know about how well young people manage a Type 1 Diabetes Diagnosis?

For young people diagnosed with Type 1 diabetes and their families, the time around diagnosis can seem confusing and frightening.

There are many different ways of coping, but we do not know a lot about how individual young people, or their families, manage. How much extra stress does this put on them? Do they need any extra help?

Why have you been asked to take part in this study?

You have recently been diagnosed with Type 1 Diabetes and will be followed up by the team at Alder Hey.

What will the study involve?

The study involves you and your family completing a series of questionnaires (maximum of 40 minutes) with a member of our team. The questionnaires will focus on the level of stress you and your family have experienced since diagnosis, how you all coped with this stress, and how the diagnosis has impacted on your quality of life. This will normally be done within the hospital before/after your diabetes clinic appointments. However, if for any reason we are unable to collect this information during this time we may need to contact you by phone or arrange to do a home visit.

What will happen next?

If you agree to take part in this study, a member of our research team will ask for a parent/guardian to sign a consent form. You may be asked to sign an assent form. We will then arrange a time to see you before/after your diabetes clinic appointments to complete the series of questionnaires.

If you turn 16 while in the study, we will ask if you wish to continue in the study. If you do, you will be asked to sign a consent form for yourself. This is because the law regarding consent changes when you turn 16.

If you are interested, we may ask you again in the future, but you can decide if you wish to take part in future.

Are there any risks/ benefits to taking part?

The questionnaires will take about 40 minutes extra, in addition to your diabetes clinic appointment. Medical care will be unaffected, but if we do find something that may affect your health, we will discuss this with you.

Some people find talking about an illness distressing. If at any time you (or your family) feel that the actual or perceived distress is too great, please do not hesitate to tell the researcher. We have clinical psychologists within our team that you might find helpful.

The information we collect may help us to improve the service we deliver to our newly diagnosed patients and help to inform a future screening protocol.

How will we use information about you?

We will need to use information from you and your medical records for this research project.

This information will include your hospital number, name and contact details. People will use this information to do the research or to check your records to make sure that the research is being done properly.

People who do not need to know who you are will not be able to see your name or contact details. Your data will have a code number instead.

We will keep all information about you safe and secure.

Once we have finished the study, we will keep some of the data so we can check the results. We will write our reports in a way that no-one can work out that you took part in the study.

What are your choices about how your information is used?

- You can stop being part of the study at any time, without giving a reason, but we will keep information about you that we already have.
- We need to manage your records in specific ways for the research to be reliable. This means that we won't be able to let you see or change the data we hold about you.

Where can you find out more about how your information is used?

You can find out more about how we use your information:

- at www.hra.nhs.uk/information-about-patients/
- by asking one of the research team
- by sending an email to d.hawcutt@liv.ac.uk, who can put you in contact with the sponsor's Data Protection Officer.

Do I have to take part?

No. If you are not happy then your doctors will keep looking after you as normal. If you are not sure then we can arrange for someone to talk to you and help you make up your mind.

Can I change my mind?

Yes, this is not a problem. If you change your mind, you can withdraw from the study at any time without giving reason (up to the point we publish the results).

Who is doing this research?

This research is being organised by the doctors at Alder Hey Children's Hospital and scientists at the Department of Women's and Children's Health at the University of Liverpool. Part of the study is being undertaken by a medical student from the University of Liverpool, who has taken an extra year in their degree to do a Masters degree (an MPhil). The student is closely supported by the doctors and scientists.

As a student project, this research has no specific funding. The sponsor is Alder Hey Children's Hospital.

Has the study been checked?

Yes. All research that involves NHS patients (like you) must be approved by a Research Ethics Committee before it goes ahead. The Committee is satisfied that your rights will be respected, that any risks have been reduced to a minimum and balanced against possible benefits, and that you have been given sufficient information on which to make an informed decision to take part or not.

Who do I ask about this?

The doctor or nurse who gave you this information leaflet can discuss the study with you more.

What if something goes wrong?

If you are unhappy, or have concerns about any aspect of this study, or would like to make a complaint, you should speak to the PALS office on 0151 252 5374, or via email PALS@alderhey.nhs.uk

Alternatively, you can contact Dr Dan Hawcutt (the researcher in charge of the study) at d.hawcutt@liv.ac.uk.

Appendix 12 Participant Information Sheet (PIS) for older participants.

PENDANT study

A study to establish if there is a relationship between how unwell children and young people are when diagnosed with Type 1 Diabetes, and how well they manage later on

Information leaflet for patients competent to consent

What is this about?

We would like to invite you to take part in our research study, to help understand the effects on families of a new diagnosis of Type 1 Diabetes. This leaflet will help you to understand why the research is being done, and what it will involve.

Our team will go through this information with you and answer any questions you may have.

What do we know about how well young people manage a Type 1 Diabetes Diagnosis?

For young people diagnosed with Type 1 diabetes, and their families, the time around diagnosis can seem confusing and frightening.

There are many different ways of coping, but we do not know a lot about how individual young people, or their families, manage. How much extra stress does this put on them? Do they need any extra help?

Why have you been asked to take part in this study?

You have recently been diagnosed with Type 1 Diabetes and will be followed up by the team at Alder Hey.

What will the study involve?

The study involves completing a series of questionnaires (maximum of 40 minutes) with a member of our team. The questionnaires will focus on the level of stress you have experienced since diagnosis, how you have coped with this stress, and how the diagnosis has impacted on quality of life. This will normally be done within the hospital before/after your diabetes clinic appointments. However, if for any reason we are unable to collect this information during this time we may need to contact you by phone or arrange to do a home visit.

What will happen next?

If you agree to take part in this study, a member of our research team will ask you to sign a consent form. Once you have consented, we will arrange a time to see you before/after your diabetes clinic appointments to complete the series of questionnaires.

If you are interested, we may ask you again in the future, but you can decide if you wish to take part in future.

Are there any risks/ benefits to taking part?

The questionnaires will take about 40 minutes extra, in addition to your diabetes clinic appointment. Medical care will be unaffected, but if we do find something that may affect your health, we will discuss this with you.

Some people find talking about an illness distressing. If at any time you feel that the actual or perceived distress is too great, please do not hesitate to tell the researcher. We have clinical psychologists within our team that you might find helpful.

The information we collect may help us to improve the service we deliver to our newly diagnosed patients and help to inform a future screening protocol.

How will we use information about you?

We will need to use information from you and your medical records for this research project.

This information will include your hospital number, name, and contact details. People will use this information to do the research or to check your records to make sure that the research is being done properly.

People who do not need to know who you are will not be able to see your name or contact details. Your data will have a code number instead.

We will keep all information about you safe and secure.

Once we have finished the study, we will keep some of the data so we can check the results. We will write our reports in a way that no-one can work out that you took part in the study.

What are your choices about how your information is used?

- You can stop being part of the study at any time, without giving a reason, but we will keep information about you that we already have.
- We need to manage your records in specific ways for the research to be reliable. This means that we won't be able to let you see or change the data we hold about you.

Where can you find out more about how your information is used?

You can find out more about how we use your information:

- at www.hra.nhs.uk/information-about-patients/
- by asking one of the research team
- by sending an email to d.hawcutt@liv.ac.uk, who can put you in contact with the sponsor's Data Protection Officer.

Do I have to take part?

No. If you are not happy to take part, then your doctors will keep looking after you as normal. If you are not sure, then we can arrange for someone to talk to you and help you make up your mind.

Can I change my mind?

Yes, this is not a problem. If you change your mind, you can withdraw from the study at any time without giving reason (up to the point we publish the results).

Who is doing this research?

This research is being organised by the Doctors at Alder Hey Children's Hospital and Scientists at the Department of Women's and Children's Health at the University of Liverpool. Part of the study is being undertaken by a medical student from the University of Liverpool who has taken an extra year in their degree to do a Masters degree (an MPhil). The student is closely supported by the doctors and scientists.

As a student project, this research has no specific funding. The sponsor is Alder Hey Children's Hospital.

Has the study been checked?

Yes. All research that involves NHS patients (like you) must be approved by a Research Ethics Committee before it goes ahead. The Committee is satisfied that your rights will be respected, that any risks have been reduced to a minimum and balanced against possible benefits, and that you have been given sufficient information on which to make an informed decision to take part or not.

Who do I ask about this?

The doctor or nurse who gave you this information leaflet can discuss the study with you more.

What if something goes wrong?

If you are unhappy, or have concerns about any aspect of this study, or would like to make a complaint, you should speak to the PALS office on 0151 252 5374, or via email PALS@alderhey.nhs.uk

Alternatively, you can contact Dr Dan Hawcutt (the researcher in charge of the study) at d.hawcutt@liv.ac.uk.

Appendix 13 Participant Information Sheet (PIS) for participants competent to consent (age 16-18).

2. Summary of amendment(s)

This template **must only** be used to notify NHS/HSC R&D office(s) of amendments, which are **NOT** categorised as Substantial Amendments.
If you need to notify a Substantial Amendment to your study then you MUST use the appropriate Substantial Amendment form in IRAS.

No.	Brief description of amendment *(please enter each separate amendment in a new row)*	Amendment applies to *(delete/ list as appropriate)*		List relevant supporting document(s), including version numbers *(please ensure all referenced supporting documents are submitted with this form)*		R&D category of amendment *(category A, B, C) For office use only*
		Nation	**Sites**	**Document**	**Version**	
1	A discrepancy in the protocol has been identified that we wish to remove. The inclusion criteria state (correctly) that we wish to only recruit children and young people who have been diagnosed in the last three months. Most patients only have one clinic appointment within the first three months, but some are seen more rapidly and have a second (or even third). The outcomes measures for this study relate to psychological trauma following diagnosis, and we are keen to use the appointment nearest 3 months from diagnosis. Therefore we wish to alter the text on page 8 from "first outpatient appointment" to "outpatient appointment within 3 months of diagnosis". Please see updated protocol that accompanies this application.	England	All sites or list affected sites	Protocol	2.0	
		Northern Ireland	All sites or list affected sites			
		Scotland	All sites or list affected sites			
		Wales	All sites or list affected sites			
2						
3						
4						
5						

[Add further rows as required]

Appendix 14 Submitted ethical amendment number 1.

2. Summary of amendment(s)

This template **must only** be used to notify NHS/HSC R&D office(s) of amendments, which are **NOT** categorised as Substantial Amendments.
If you need to notify a Substantial Amendment to your study then you MUST use the appropriate Substantial Amendment form in IRAS.

No.	Brief description of amendment *(please enter each separate amendment in a new row)*	Amendment applies to *(delete/ list as appropriate)*		List relevant supporting document(s), including version numbers *(please ensure all referenced supporting documents are submitted with this form)*		R&D category of amendment *(category A, B, C) For office use only*
		Nation	**Sites**	**Document**	**Version**	
1	It has been noted that many dyads are willing to complete the questionnaires but are unable to take the extra time at the clinic appointments to complete them due to work/school/childcare commitments. On page 8 in v2.0 of our study protocol, we stated that families unable to complete the questionnaires on the day would be offered the opportunity to complete them over the phone. However, our early impressions are that the extensive nature of the questionnaires would make them unsuitable for completion by phone. We are of course still keen to capture this group of patients and so have amended the option of a phone call to an option of a home visit by a member of the study team at a mutually convenient time. Any before any home visit, the attending research team member will notify another member of the team who and where they are visiting and will once again notify them once the visit is completed. Please see updated protocol that accompanies this application.	England	All sites or list affected sites	Protocol	3.0	
		Northern Ireland	All sites or list affected sites			
		Scotland	All sites or list affected sites			
		Wales	All sites or list affected sites			
2						
3						
4						

Appendix 15 Submitted ethical amendment 2.