

1 **Extraordinary Virtual Multidisciplinary Team Meetings: A novel**
2 **forum for coordinated care of patients with complex conditions**
3 **within a secondary care setting.**

4

5 **Abstract**

6 Multi-disciplinary teams (MDT) meetings are increasingly regarded as best practice for the
7 successful management of chronic disease. However, for patients with undiagnosed
8 illnesses, multiple interacting comorbidities or other complex needs that fall outside the
9 remit of disease-specific MDTs or the scope of expertise of individual clinicians, there is
10 often no suitable forum at which to discuss their care to develop a coordinated plan for
11 management. We developed and piloted a new forum for inter-specialty discussion and
12 collaboration – an extraordinary virtual MDT – to enable clinicians to arrange an urgent
13 meeting of all involved parties in response to challenging clinical scenarios. We share our
14 experience of implementing this innovation and suggest how this novel forum for
15 coordinated care may be further developed to improve the integration, timeliness and
16 quality of healthcare delivery for patients with complex needs.

17

1 **Introduction**

2 Multi-Disciplinary Teams (MDT) meetings have become commonplace in modern
3 healthcare.^{1,2} However for many patients with undiagnosed illnesses or complex needs the
4 current system of disease-specific MDTs is inadequate and there is often no alternative
5 inter-specialty forum at which to discuss their care. We developed and piloted the new
6 concept of extraordinary virtual MDT meetings for patients with complex conditions within
7 a secondary care setting. In this article, we share our experience and discuss how this novel
8 forum for coordinated care may be further developed to improve the quality of healthcare
9 delivery.

10 **The increasing challenge of delivering integrated care**

11 MDT meetings were introduced into UK practice for cancer care in the 1990s to ensure
12 equality of access to standardized, high-quality care and were shortly after adopted as a
13 mandatory component of cancer case-management.³⁻⁵ Patients managed via MDTs report
14 improved satisfaction, receive more timely treatment and, for some tumour types, have
15 improved survival.⁶⁻⁹ Over the last decade, MDTs in other specialties have proliferated such
16 that most hospitals or regions have regular MDT meetings for various conditions (e.g. heart
17 failure, stroke, tuberculosis). The concept of MDT working is now widely accepted and
18 considered good practice for successful management of chronic disease.^{1,3}

19 MDT meetings typically involve a predefined membership of clinicians meeting regularly –
20 usually in face-to-face meetings – at a recurring fixed time to discuss patients with a specific
21 condition.¹⁰ However, for some patients with rare or complex conditions, multiple

1 interacting comorbidities or those without a clear diagnosis, there is often no appropriate
2 routine MDT in which to discuss their care. These patients with complex needs – who stand
3 to benefit from the collaborative approach of a MDT format – are often instead subject to
4 multiple sequential reviews from various specialist teams and are at risk of experiencing
5 delayed and fragmented care.¹¹ In Box 1, we describe our experience of a patient whose
6 care was adversely affected by the absence of a suitable forum to bring together the
7 numerous clinicians involved in his care. The parallel trends of increased life expectancy
8 with the attendant risk of accumulating multiple chronic illnesses and the drive towards
9 centralisation of healthcare services¹² is likely to mean that a growing number of patients
10 will have illnesses that fall outside of the scope of expertise of any individual clinician or the
11 remit of disease-specific MDTs. Without effective mechanisms for inter-specialty working
12 they are at risk of fragmented care.^{11,13} We believe that these patients with complex
13 conditions require some form of MDT that can convene quickly to develop coordinated
14 management plans.

15 **An extraordinary virtual MDT for complex conditions**

16 We developed the concept of an extraordinary MDT for patients with complex conditions in
17 which a lead clinician responsible for a patient's care could request a promptly arranged
18 meeting of all involved parties in response to a challenging clinical scenario (e.g. diagnostic
19 dilemma, need for coordinated treatment plan). We envisaged that the discussions of
20 complex patients would often involve clinicians from various specialties spread across
21 different sites such that a face-to-face meeting would be difficult to arrange at short notice.
22 We therefore developed, in parallel, the technological and logistical mechanisms to enable

1 attendees to participate remotely. Although virtual MDTs have been used in community
2 settings, to our knowledge, this combination of an *ad hoc* multispecialty forum for
3 coordinated case management facilitated by a virtual platform has not been described
4 previously in a secondary care setting.

5 From June 2016 to June 2017, we conducted a pilot exercise to assess both the feasibility
6 and utility of a system for extraordinary virtual MDTs (Ex-vMDT). The project was supported
7 by a grant from the Innovation Agency (formerly North West Coast Academic Health Science
8 Network) to fund the purchase of video conferencing software.

9 During the pilot phase, we restricted the use of the Ex-vMDT system to discuss patients who
10 were not suitable for inclusion in another established MDT and met one or more of the
11 following criteria: lacked a confirmed diagnosis and treatment plan; required a coordinated
12 plan for investigation, discharge-planning or follow-up; had a complex diagnostic or
13 therapeutic dilemma likely to benefit from a multi-disciplinary approach. Patients could be
14 referred from any consultant within the Trust via an online referral system (see Figure 1).

15 We used the GoToMeeting video conferencing software (LogMeIn, Inc.; Boston, US) that
16 provides robust end-to-end encryption and allows conferencing from multiple sites and for
17 users to share files and screens. The outcome of the Ex-vMDT was recorded on a standard
18 proforma and shared with all participants, the patients' GP and where appropriate the
19 patients themselves.

20 The pilot was evaluated by collating feedback from participants using a standardised
21 questionnaire that asked respondents to rate their satisfaction with the process,

1 technologies and outcome of the Ex-vMDT meeting (Figure 2). Feedback from patients
2 discussed at the meeting was sought when appropriate.

3 **Pilot study outcomes**

4 Over the course of the 12-month pilot, the care of five patients referred by five consultant
5 physicians was discussed in Ex-vMDT meetings (Table 1). Three patients had unknown
6 diagnoses and the focus of the discussion was to devise a coordinated plan for investigation.
7 The other two patients were suspected to have primarily functional illnesses and the focus
8 of the Ex-vMDT meetings was to agree an integrated plan of care and follow-up. Four
9 meetings included practitioners based at different hospital sites from the requesting
10 clinician and one involved the patient's GP.

11 ***Clinician feedback***

12 The feedback from the nine clinicians who completed the feedback survey suggests that not
13 only was the Ex-vMDT meeting able to achieve material improvements in the quality of care
14 (Figure 2), but that these advances would have been unlikely to occur without the Ex-vMDT.
15 Clinicians felt that such a system was needed and valued the support provided by the MDT
16 coordinator. They were satisfied with the ability to participate from any location and ease of
17 joining the meeting but felt the referral process and audio-visual technicalities needed to be
18 improved.

19 One clinician remarked, *"All members of the MDT felt that it was extremely useful and*
20 *helpful process allowing clear discussions between each specialty team. Most importantly, it*
21 *allowed us to move to planning discharge and the patient was discharged within ten days to*

1 *neuro-rehab after having been in hospital for 6 months! Without the MDT this would not*
2 *have happened.”*

3 ***Patient feedback***

4 Feedback was obtained from two of the five patients discussed. Both patients indicated that
5 they valued the meeting and felt that it improved their experience of care.

6 One commented: *“Excellent. Care was well coordinated after the MDT. Everybody knew*
7 *what they were doing. I also knew what was going on as the letter which was sent to me*
8 *was put in a language that I could understand.”*

9 Another remarked, *“When in hospital there were times when different teams had to wait*
10 *until they could meet with other teams for example infection teams had to wait to speak*
11 *with liver team and kidney team and it took a longer time. Using the new way, they don’t*
12 *have to be in the same room.”*

13 **Challenges to implementation**

14 ***Establishing the Ex-vMDT system***

15 The process of setting up the Ex-vMDT system took six months and was substantially
16 delayed by the time taken to receive local information governance approval. The use of
17 video-conferencing software from an external provider to discuss confidential information
18 was an understandable concern that had to be fully assessed. National approval and
19 procurement of appropriate software may obviate the need for similarly protracted
20 approval processes in other hospitals.

1 ***Coordination of Ex-vMDT***

2 Identifying and agreeing a suitable time and date for the meetings between several
3 clinicians sometimes working across multiple sites proved a significant logistical challenge
4 Sometimes even identifying a suitable clinician within each specialty to participate proved
5 difficult. On-call clinicians were often unable to commit to a scheduled meeting due to the
6 unpredictable nature of their workload.

7 The composition of any MDT is an important consideration: if too small it may lack the
8 breadth of expertise required to deal with complex problems; if too large communication
9 may be impaired and reaching a consensus plan more difficult.^{1,10} In this pilot, we left it to
10 the discretion of the requesting clinician to decide on the invitees. In two of the five
11 meetings conducted, several key parties failed to attend. We would recommend that
12 referring clinicians restrict participation to essential members to facilitate timely scheduling.

13 As with any MDT meeting, the effectiveness of the Ex-vMDT is critically dependent on
14 leadership.^{1,10} Whilst in this pilot we provided the support of a MDT coordinator for
15 logistical and technological issues, the active engagement of the lead clinician in facilitating,
16 planning and running of the Ex-vMDT meeting was vital. Direct communication between the
17 lead clinician and invitees ahead of contact by the MDT coordinator eased the planning of
18 the meeting.

19 ***Conduct of the MDT - technology***

20 In this pilot study, deficiencies in the quality of the audio-visual link were the key criticism of
21 participants and we will address this as a priority in further developing the service. Whilst

1 virtual meetings have successfully been adopted as feasible alternative to traditional face-
2 to-face meetings in a variety of settings,^{14,15} they present specific challenges to effective
3 communication. Even with modern video conferencing systems, some of the richness of
4 information conveyed by nonverbal cues is lost and effective communication constrained.¹⁰
5 Participants may unconsciously respond to the limitations of system by adopting a more
6 assertive form of conversation that may inhibit discussion.¹⁰ The impact of the intrinsic
7 limitations of the medium on the effectiveness of the meeting are amplified by any
8 technical difficulties.¹⁶ These challenges are further accentuated by the context of an
9 extraordinary meeting in which the participants may not know each other.

10 **Plans for further development**

11 *Overcoming barriers to use*

12 Whilst widely regarded as a potentially useful innovation, the Ex-vMDT system was not
13 universally welcomed. The fear of getting inundated with requests to join such meetings
14 was raised by a number of clinicians. Clinicians who participated in the meetings did so
15 during their free time; there was no mechanism for their departments to be remunerated
16 for their contribution. If extraordinary MDTs were to be used widely, the activity would
17 need to be appropriately incentivised.¹⁰

18 During the pilot, only physicians requested Ex-vMDT. Further work is needed to understand
19 why surgeons did not use the Ex-vMDT and whether the innovation could be adapted to suit
20 their needs and those of their patients. It is likely that many clinicians already use informal
21 virtual networks of case discussion (e.g. via email) to discuss challenging clinical scenarios

1 with colleagues in other specialties. For the Ex-vMDT format to be widely adopted, clinicians
2 will need to be convinced that this forum that supports synchronous discussion in real-time
3 provides genuine added value to patient care over these existing methods of
4 communication.

5 Lack of familiarity with audio-visual conferencing technology may have contributed to the
6 reticence to participate expressed by some clinicians. The use of video-conferencing
7 technologies or other forms of virtual working is already widespread in healthcare and will
8 doubtless increase.¹⁷ Suitable training and support packages are needed to overcome this
9 barrier. Some medical schools have already incorporated practical case-based teaching
10 programmes on virtual team working into their undergraduate curricula.¹⁸

11 ***Integration of primary and secondary care***

12 Whilst the initial objective of the Ex-vMDT meeting was to improve care coordination
13 between specialities within secondary care, several of the patients discussed had complex
14 needs that required input from primary care and mental health services. Inefficient
15 information flow between care providers in different sectors (e.g. physical and mental
16 health services) is a key barrier to delivering effective integrated care for patients with
17 complex needs.^{2,11} Similar virtual MDTs may greatly facilitate coordinated care for selected
18 patients.

19 ***Shared decision-making***

20 The lack of direct patient participation is a potential shortcoming of the MDT approach to
21 case management.¹⁹ In this pilot, we provided patients with written documentation of the

1 Ex-vMDT meeting and invited their feedback. If a virtual MDT format was widely adopted,
2 mechanisms to promote shared decision-making should be developed.²⁰

3 ***Developing key performance indicators***

4 There are opportunity costs associated with MDT meetings and whilst a virtual format
5 mitigates some of these, a robust series of performance measures are nonetheless required.
6 Process measures may include evidence that: referrals are processed promptly; all relevant
7 parties attend; the technology functions effectively. Potential outcome measures could
8 include: the meeting is convened within a suitable time frame; evidence that the MDT
9 recommendation was acted upon; patient satisfaction of decision-making process.¹⁰

10 **Conclusion**

11 The availability of versatile and affordable digital conferencing technologies presents an
12 excellent opportunity to improve inter-speciality collaboration and enhance the integration,
13 timeliness and quality of healthcare delivery for patients with complex needs.

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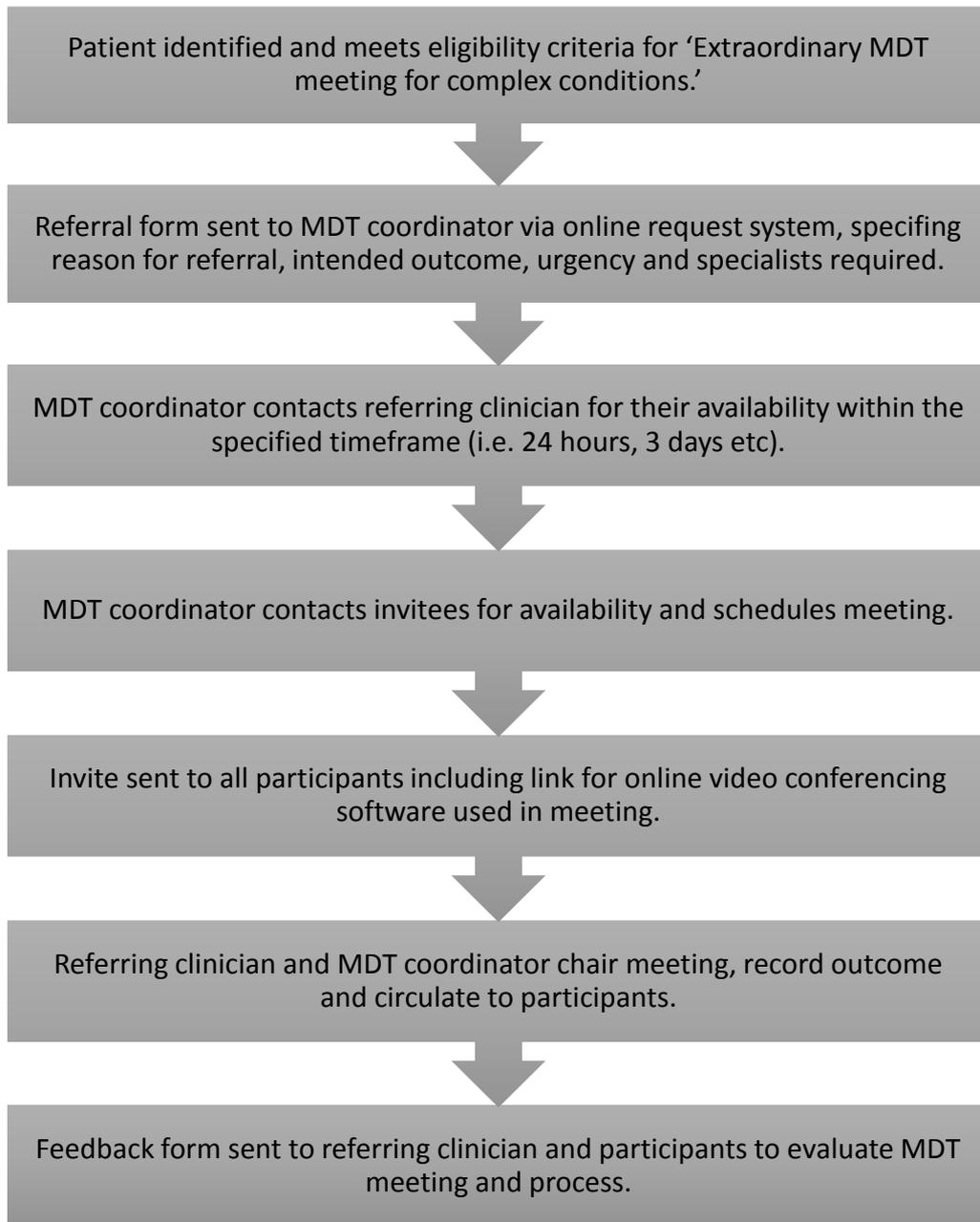
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1 **Box 1.** Case study: Delayed diagnosis and the need for an extraordinary MDT.

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An adult patient was admitted to our hospital with fever, breathlessness, weight loss, enlarged lymph nodes and abdominal swelling. A CT scan showed ascites, extensive intra-abdominal nodes and enlarged hilar and peripheral nodes. Initial investigations for tuberculosis and lymphoma were performed. The case was discussed at the weekly TB MDT and empirical TB treatment started. Unfortunately, the patient did not improve and TB treatment was stopped. Multiple individual specialists reviewed the patient and gave their clinical opinion about investigation and management – gastroenterologist, respiratory physicians, haematologist, rheumatologist, infectious diseases physicians and multiple surgeons. Attempts at obtaining a diagnosis by analysing ascitic fluid and peripheral lymph node biopsy were unsuccessful. Laparoscopic biopsy of intra-abdominal lymph nodes was felt to be too risky and hence avoided by the surgical team. When a decision was made to perform a surgical biopsy, the patient was too unwell and unfortunately died after being in hospital for 6 weeks. A post-mortem was carried out and confirmed a diagnosis of lymphoma that was potentially treatable.



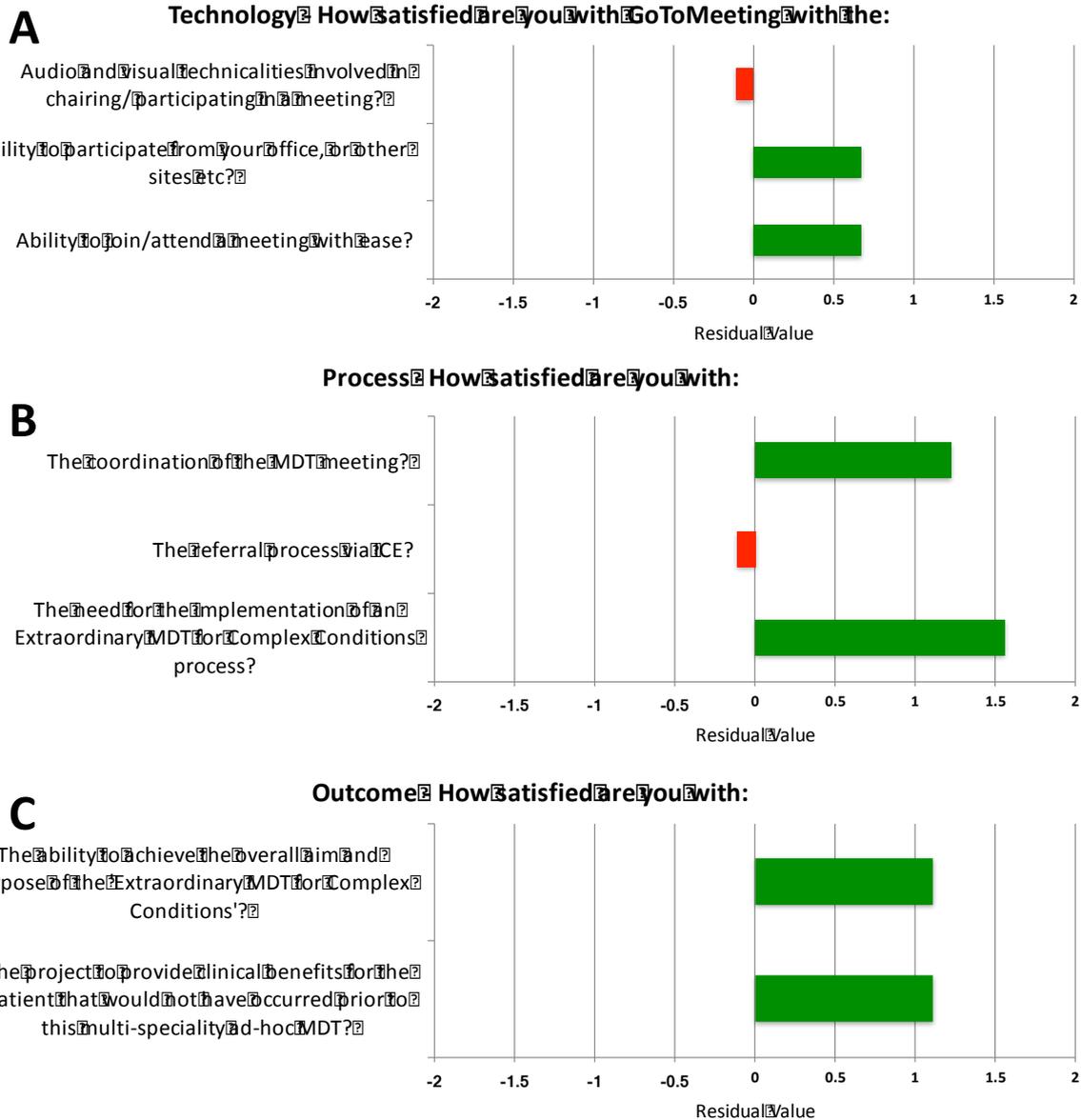
2 **Figure 1.** Flow chart for an 'Extraordinary virtual MDT for complex conditions' illustrating
3 processes from referral to feedback.

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1 **Table 1.** Patients discussed during the Extraordinary virtual MDT meeting system pilot study.

Case	Summary of MDT	Outcome
Medical inpatient with pre-existing chronic pelvic pain admitted with medically unexplained paraplegia and sensory deficits.	MDT involving clinicians across three hospitals: - gynaecologist, general physician and physiotherapist. Psychiatrist provided input before the meeting via email	Consensus diagnosis of somatisation illness made and coordinated follow-up plan agreed.
Complex outpatient with background of chronic liver and kidney disease under review for non-resolving pulmonary mass	MDT involving infectious diseases physician, two respiratory physicians and radiologist	Joint agreement to treat for tuberculosis and coordinated plan for follow-up after 3 months.
Acute kidney injury due to suspected microangiopathy following diarrhoeal illness and unexplained ascites requiring recurrent paracentesis	MDT meeting involving nephrologist, hepatologist, haematologist and histopathologist.	MDT concluded unlikely underlying microangiopathy. Agreed joint plan for further investigation. Referral to gastroenterologist to exclude protein-losing enteropathy.
6-month inpatient stay with acute cerebellar disorder of unknown cause complicated by recurrent aspiration pneumonia and intra-abdominal sepsis	MDT meeting involving representatives from neurology, immunology, general surgery and clinical pharmacology.	Targeted investigations to confirm and refute various differential diagnoses. Clarification of prognosis and plans for discharge. Discharged 10 days following MDT.
Chronic dysphagia, vomiting and malnutrition. Recurrent admissions with complications related to gastrostomy feeding and parenteral nutrition.	MDT meeting involving gastroenterologist, nurse consultant in nutrition, dieticians at tertiary unit, surgeon and psychiatrist at referring hospital, and general practitioner.	Discussion revealed significant pre-morbid psychological issues. Agreed joint plan for investigation and management across sites.

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3 **Figure 2.** Residual bar charts showing feedback from 9 participants of the Extraordinary
 4 virtual MDT meeting pilot in the following domains: (A) Technology; (B) Process; (C)
 5 Outcome. Respondents rated agreement with individual statements using a 5-point scale
 6 ('Not at all', 'Somewhat', 'Not applicable', 'Very', and 'Extremely'). Residual values
 7 calculated by subtracting 3 (i.e. mid-point 'Not applicable' score) from the weighted average
 8 of responses. Areas with which respondents very or extremely satisfied shown in green and
 9 not at all or only somewhat satisfied in red. ICE = Hospital electronic system for laboratory,
 10 radiology requests and specialty referrals.

11

Key messages

- We have developed and successfully piloted the concept of an extraordinary virtual MDT meeting for complex conditions.
- We have shown that such a virtual MDT is valued by clinicians and patients and can improve diagnosis, treatment and discharge planning.
- Further research is needed to assess its utility when used at large scale and, also explore how it could be used for surgical patients, paediatric patients and within primary and social care.
- Patient involvement and feedback also needs to be developed and assessed further.

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