

1 **TITLE PAGE**

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3 **FULL TITLE:** Raring to go? A cross-sectional survey of student paramedics on how well they perceive
4 their UK pre-registration course to be preparing them to manage suspected seizures.

5

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1 **ABSTRACT**

2 **Background:** Paramedics convey a high proportion of seizure patients with no clinical need to
3 emergency departments (EDs). In a landmark study, only 27% of UK paramedics reported being
4 “Very...”/“Extremely confident” making seizure conveyance decisions. Improved pre-registration
5 education on seizures for paramedics is proposed. Clarity is needed on its potential given recent
6 changes to how UK paramedics train (namely, degree, rather than brief vocational course). This study
7 sought to describe UK student paramedics’ perceived readiness to manage seizures and educational
8 needs; compare this to what they report for other presentations; and, explore subgroup differences.

9 **Methods:** 638 students, in year 2 or beyond of their pre-registration programme completed a cross-
10 sectional survey. They rated perceived confidence, knowledge, ability to care for, and educational
11 needs for seizures, breathing problems and, headache. Primary measure was conveyance decision
12 confidence.

13 **Results:** For seizures, 45.3% (95% CI 41.4-49.2) said they were “Very...”/“Extremely confident” to make
14 conveyance decisions. This was similar to breathing problems, but higher than for headache (25.9%,
15 95% CI 22.6-29.5). Two hundred and thirty-nine participants (37.9%, 95% CI 34.1-41.8) said more
16 seizure education was required – lower than for headache, but higher than for breathing problems.
17 Subgroup differences included students on university-based programmes reporting more confidence
18 for conveyance decisions than those completing degree level apprenticeships.

19 **Conclusions:** Student paramedics report relatively high perceived readiness for managing seizures.
20 Magnitude of benefit from enhancements to pre-registration education may be more limited than
21 anticipated. Additional factors need attention if a sizeable reduction to unnecessary conveyances for
22 seizures is to happen.

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1 **KEYWORDS:** Paramedics, Emergency Medical Services; Ambulance; Seizures; Epilepsy; Students;

2 Decision Making.

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1 **BACKGROUND**

2 **Seizures and the ambulance service**

3 Each year, England's ambulance services respond to ~211,000 calls for suspected seizures – making
4 them the seventh most common presentation.[1, 2] The care offered should align with patient need
5 and represent efficient resource use. This may not always be happening. Data indicates adults have
6 often been taken by paramedics to emergency departments (EDs), despite no clinical need.[1, 3-5]
7 Other countries report similar issues.[6, 7]

8

9 **Need for conveyance to emergency department after a seizure**

10 Seizures can be complex as they can be symptomatic of a wide range of brain pathologies, and ED for
11 them can be important. Reasons ED might be required include status epileptics, a seizure in the
12 context of known or possible pregnancy, significant actual or potential injury and persistent changes
13 in awareness or behaviour that may jeopardize safety if left alone. However, as noted by ambulance
14 care guidelines,[8] for most adult cases seen by paramedics, ED is not required. Many occur in the
15 context of an established diagnosis, such as epilepsy or functional neurological disorder,[4, 9] and
16 present little need for ED. Dickson et al.[1] reviewed records from one English service. Seizures had
17 self-terminated in >90% of cases, breathing was normal for >96% and most people were recovering
18 without intervention. Nevertheless, crews advised ED for 89%.

19 Taking a person to ED who does not require it, results in a 'avoidable attendance' (AA). As well
20 as being potentially inconvenient,[10] AAs can harm the patient due to unnecessary
21 investigations/treatments,[11] and have implications for others since they restrict ED capacity.[12]
22 They are also costly.[13]

23

24 **Insufficient education on seizures for paramedics identified as important**

25 So, what can be done to reduce AAs for seizures? One suggestion is improved seizure education for
26 paramedics.[14] This is because studies with UK (United Kingdom) paramedics[15-18] consistently

1 indicate many believe their education on seizures was insufficient, meaning their knowledge of the
2 presentation can be inadequate and they feel apprehensive about managing them. Key quotes from
3 qualitative studies with practicing UK paramedics on this topic include:

4 *“Training on managing seizures...you might get a couple of hours, if that... The focus is really on the
5 emergency side of things.” [16]*

6 *“We’re really good at dealing with respiratory disorders and we’re really good at dealing with heart
7 attacks. We’ve had so much focus on those conditions ... I just don’t think that neurological disorders
8 people feel the same level of confidence generally” [17]*

9 *“There is this...sort of anxiety...the patient presentation is slightly beyond what you’re comfortable
10 with [so] you take the patient to ED...”[15]*

11 *“I don’t mind sitting there for an hour or so just trying to convince them [the patient] to go to
12 hospital”[15]*

13 Non-emergency states, such as terminated or self-resolving seizures, are described as
14 particularly difficult to manage, with paramedics saying they often have little confidence in
15 identifying the needs of patients and deciding whether ED conveyance is necessary. Indeed, Kinney
16 et al.[18] surveyed UK ambulance clinicians and found only a minority were confident in making
17 conveyance decisions.

18

19 **Is paramedic education *still* insufficient?**

20 It is unclear whether pre-registration education still requires improvement. Why? Because the earlier
21 findings come from studies whose samples were dominated by paramedics trained via the traditional,
22 vocational system. Those now entering services have, in contrast, qualified via a higher education-
23 supported model.

1 Rather than completing a 6-8 week theoretical programme with a period of consolidation in
2 practice, UK paramedics now complete a professional regulator approved,[19] 3-4 year university-
3 based degree programme or a 2-4 year degree level apprenticeship. Since ~2021 only paramedic
4 educational programmes at or above degree level have been permitted to admit new learners.

6 **Current study**

7 Any change to paramedic education requires careful justification. A systematic search of the literature
8 found no evidence on how well the higher education-supported model is preparing paramedics to
9 manage seizures (Additional File 1). Therefore, this study reports a survey of current UK student
10 paramedics. It sought to:

- 12 1) Describe their perceived readiness to manage seizures and educational needs;
- 13 2) Compare this to what they reported for some other patient presentations; and
- 14 3) Explore whether perceived readiness was related to specific type of education or academic
15 year of study.

17 **METHODS**

18 **Design**

19 An anonymous cross-sectional online “open” survey hosted by Qualtrics was conducted between
20 November 2022 and January 2023. Developed in consultation with stakeholders, it asked student
21 paramedics about their perceived confidence, knowledge, ability to care for, and educational needs
22 for, persons experiencing three different presentations. They were seizures, breathing problems and,
23 headache. We followed Porter [20] in understanding self-confidence as the belief in one’s ability to
24 accomplish a specific goal or task [21] and closely related to Bandura’s [22] concept of self-efficacy.
25 Whilst actual knowledge refers to possession of information involved in seizure management, we, in

1 line with Park et al. [23], understood perceived knowledge as referring to one's self-assessment or
2 feeling of knowing the information needed for seizure management.

3 To avoid providing explicit cues as to the study's aims and influencing responses, the survey's
4 interest in seizures was obscured.

5

6 **Eligibility criteria**

7 To participate, respondents needed to confirm they were aged ≥ 16 years; enrolled on a UK
8 educational programme that would qualify them for paramedic registration; were in year 2 or beyond;
9 and that they could independently complete a questionnaire in English. Educators advised restricting
10 participation to students in year 2 or beyond because the 'spiral' framework followed by paramedic
11 programmes [19] meant it unlikely seizures would have been considered in detail until this point.

12

13 **Recruitment**

14 Thirty-one (67.4%) of the 46 universities offering ≥ 1 approved [24] paramedic courses at the time and
15 who had students in years 2 or beyond cascaded a recruitment advert to students (Additional File 2).
16 The advert was also posted within social media groups for student paramedics (Acknowledgements).
17 Interested persons were directed to a survey page. Participation was voluntary. To incentivise
18 recruitment, the first 300 people submitting complete responses each received a £5 voucher.

19

20 **Ethical Approval**

21 Approval was provided by the University of Liverpool's Ethics Committee (Ref: 11962). All participants
22 provided informed consent and could download a Participant Information Sheet that informed them
23 length of time of the survey, which data were stored and where and for how long, who the
24 investigators were, and the purpose of the study. Reporting conforms with the CHERRIES statement.

25

26 **Survey content**

1 Overview

2 After questions about their characteristics, participants were presented with a series of measures to
3 complete for each presentation. The order the presentations were asked about was randomised by
4 Qualtrics. Additional File 3 provides the full survey.

5 The number of questionnaire pages was 21, with items per page ranging from 1 to 6. Response
6 techniques were used to minimise burden and survey question validation was used to force
7 respondents to answer each question. No 'back button' or review step was incorporated into the
8 survey to enable participants to review and change their answers. No procedures were used to
9 prevent or screen out multiple submissions. Search engines were though, blocked from including the
10 survey in their search results.

11 Breathing problems and headache were considered informative comparators. Breathing
12 problems are frequently seen by paramedics (third most common),[1, 2] but are less likely to be
13 unnecessarily conveyed.[3] Headache in contrast is infrequently seen by paramedics (twenty fourth
14 most seen presentation),[1, 2] but it has a high rate of AA following ambulance attendance.[3]

15

16 Measures

17 For each presentation, participants were administered the following:

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19 *Confidence in making conveyance decisions*

20 Participants were asked "How confident would you say you would be in deciding whether or not to
21 convey a 'X' patient to ED?". As per Kinney et al.'s[18] study, participants responded using a 5-point
22 Likert scale (1= "Not at all confident"; 2= "Slightly confident"; 3= "Reasonably confident"; 4= "Very
23 confident"; 5= "Extremely confident").

24

25 *Perceived knowledge of, ability to care for and confidence to care*

1 Waltrich's[25] 15-item questionnaire, with minor adjustments, was used. It asked participants to rate
2 perceived knowledge (e.g., "My knowledge of 'X' patients is comprehensive"), ability to provide care
3 (e.g., "I believe my education and training is preparing me well to provide care that benefits 'X'
4 patients") and confidence to care (e.g., "I would feel comfortable in my ability if I were to attend a
5 patient with a 'X' problem'). They responded using a 5-point Likert scale (1= "Strongly disagree", 5=
6 "Strongly agree"); some items were reverse scored.

7 As the measure was designed for use with qualified paramedics, we amended it to remove
8 references to the person's everyday practice to make it suitable for students (Additional File 4).

9 Participants responses to the items were totalled and, as per the measure's manual,
10 converted into a percentage of maximum possible (POMP) score (range 0-100, higher scores indicating
11 higher perceived ability).

12 The scale's internal consistency was acceptable (α range 0.75 to 0.85).

13

14 *Educational need*

15 Participants were asked "Do you think you should/should have received more training on 'X' via your
16 pre-registration programme?" Response options were Yes, Unsure and No.

17

18 **Analyses**

19 Sample size

20 Participants' confidence to make conveyance decisions for seizures was the primary parameter our
21 descriptive study sought to estimate – specifically the proportion who perceived themselves to
22 "Very..."/"Extremely confident". To calculate the required sample size, the following formula for
23 estimating proportions was used: $N = (P(100\% - P)) / (SE)^2$, where P is the anticipated proportion and SE
24 the standard error.

25 No existing estimate was available on the anticipated proportion of student paramedics that
26 would be found to report being "Very..."/"Extremely confident". However, in Kinney et al.'s[18] study,

1 27.7% *practicing* paramedics did report this. This was used as P for the calculations. We stipulated a
2 need for the sample to be sufficient to mean there would be 99% confidence that the estimate
3 generated was within $\pm 5\%$ of the true proportion – thus the SE was 1.95 (5/2.56). Using these figures,
4 the sample size calculation stated a need for 527 participants with complete data.

5

6 Statistical analyses

7 Analyses were completed using data from participants with valid submissions – defined as a
8 participant having, as a minimum, completed Waltrich’s[25] measure (it appeared first in our survey
9 pack, after the demographic questions). No imputation occurred. Where available, the characteristics
10 of individuals who did and did not make a valid submission are presented side-by-side to evaluate
11 representativeness.

12 The data from the 3 measures differed in nature and so different tests were required. The
13 tests used for the different measures and the reasons why were as follows:

14 *Confidence in making conveyance decisions:* Given the restricted number of ordinal categories
15 available to respond to the conveyance confidence question, central tendency is described according
16 to the median (Mdn) and interquartile range (IQR). Friedman’s 2-way ANOVA compared participants’
17 responses for the three presentations. Mann-Whitney U tests explored whether responses differed
18 according to education type (university-based vs apprenticeship) or year of study (year 2 or later).

19 *Perceived knowledge of, ability to care for and confidence to care:* For Waltrich’s[25]
20 questionnaire, there was a higher number of occupied categories and the distribution for POMP scores
21 approximated normal. Therefore, means (M) and standard deviations (SDs) are used. Repeated
22 measures one-way ANOVAs compared participants’ scores for the presentations. Independent t-tests
23 (with bootstrapping) explored subgroup differences (education type; year of study).

24 *Educational need:* The proportion of participants saying “Yes” more training for seizures was
25 required is reported. Cochran’s Q Test compared the proportions saying this for the different

1 presentations, whilst the Chi-square test explored subgroup differences (education type; year of
2 study).

3 To account for multiple comparisons, alpha for all main analyses was set at .01. Only
4 statistically significant subgroup differences are reported.

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6 **RESULTS**

7 **Responses**

8 There were n=685 survey submissions. Of these, n=638 (93.1%) were valid. It took them a mean of
9 23.4 minutes to complete the survey (SD 8.9).

10 Those who started, but did not sufficiently complete the measures for it to be considered valid
11 were broadly comparable to those who did (Table 1).

12

13 **Participant characteristics**

14 The median age of the n=638 participants was 23 (IQR 20-26), with 464 (72.7%) being female (Table
15 1). Most (85.1%) were students in England and university-based (79.3%), rather than studying via an
16 apprenticeship (21.4%).

17 Participants who were university-based and those on an apprenticeship were similar in age
18 and sex. Those on an apprenticeship were less likely to be in year 2 (21.2 vs 46.1%; $X^2(1)= 26.662$,
19 $p<0.001$).

20

21 **Measures**

22 Confidence in making conveyance decisions

23 With respect to seizures, 45.3% (95% Confidence Interval [CI] 41.4–49.2) of participants said they
24 perceived themselves to be “Very...” or “Extremely confident” to make non-conveyance decisions
25 (Table 2).

1 For breathing problems, 50.3% (95% CI 46.4–54.3) said they were “Very...” or “Extremely
2 confident”, whilst for headache it was 25.9% (95% CI 22.6–29.5). In line with this, perceived confidence
3 differed significantly for the presentations (Friedman $\chi^2=125.599$ (2), $p<0.001$). Bonferroni
4 comparisons found confidence for headache to be significantly lower than for seizures ($r=-0.23$) and
5 breathing problems ($r=-0.26$).

6 A subgroup difference was that those on a university-based course expressed significantly
7 more confidence for seizures than those studying via an apprenticeship ($U= 25612.0$, $p<0.01$; $r= 0.16$);
8 49.2% of the former described themselves as “Very...” or “Extremely confident” compared to 30.3%
9 of the latter. They also expressed more confidence for breathing problems ($U= 26985.0$, $p<0.01$;
10 $r=0.14$).

1 **TABLE 1.** Characteristics of student paramedics with valid submissions for inclusion in data-set

	Included in data-set
Characteristic	N=638
Age Median (interquartile range)	23 (20, 26)
Missing	0
Sex, n (%)	
Male	174 (27.3%)
Female	464 (72.7%)
Prefer not to say	0
Missing	0
Training route, n (%)	
University-based (BSc, MSc)*	506 (79.3%)
Apprenticeship	132 (20.7)
Missing	0
Year of current study, n (%)	
Year 2	262 (41.1%)
Year 3	312 (48.9%)
Year 4	64 (10.0%)
Missing	0
Location of training within UK, n (%)	

	Included in data-set
Characteristic	N=638
Northern Ireland	5 (0.8%)
Scotland	69 (10.8%)
Wales	21 (3.3%)
England	543 (85.1%)
Missing	0
North West	93 (17.1%)
West Midlands	90 (16.6%)
Yorkshire and Humber	84 (15.5%)
South West	77 (14.2%)
South East	67 (12.3%)
East of England	54 (9.9%)
London	45 (8.3%)
East Midlands	33 (6.1%)

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2 *Notes* BSc, Bachelor of Science; MSc, Master of Science; * includes nurse paramedic course;

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4 Perceived knowledge of, ability to care for and confidence to care

5 The mean POMP score for seizures was 66.6 (95% CI 63.7–65.0; SD 11.3).

6 POMP scores for the different presentations varied significantly ($F(1.95, 1274) = 152.046$,

7 $p < 0.001$; $\epsilon = 0.97$; $\eta_p^2 = 0.19$). Participants expressed lower scores for seizures (mean difference [MD] = -

8 6.5, 95% CI -7.9 to -5.1) and headaches (MD = -8.6, 95% CI -10.3 to -6.9) than for breathing problems.

1 **TABLE 2** Confidence n=638 participants reported to make conveyance decisions by presentation

<i>Confidence in making conveyance decisions measure</i>	<i>Presentation</i>		
	<i>Seizure</i>	<i>Breathing problem</i>	<i>Headache</i>
<i>Extremely confident, n %</i>	107 (16.8%)	105 (16.5%)	54 (8.5%)
<i>Very confident, n %</i>	181 (28.5%)	215 (33.8%)	111 (17.5%)
<i>Reasonably confident, n %</i>	212 (33.3%)	188 (29.6%)	229 (36.0%)
<i>Slightly confident, n %</i>	97 (15.3%)	97 (15.3%)	175 (27.5%)
<i>Not at all confident, n %</i>	39 (6.1%)	31 (4.9%)	67 (10.5%)
Missing	2	2	2

2

3 *Notes:* IQR, interquartile range; n, number.

1 The POMP score for headaches was also significantly lower than for seizures (mean
2 difference= -2.1, 95% -3.6 to -0.6).

3 Compared to those studying via an apprenticeship, those who were university-based reported
4 significantly higher POMP scores for seizures (MD= 4.4, bias-corrected and accelerated bootstrap
5 [BCa] 99% CI 2.2–6.8; $d=0.38$) and breathing problems (MD= 11.5, BCa 99% CI 8.9–14.1; $d=0.88$). Those
6 in year 3 or beyond of their studies had significantly higher POMP score for breathing problems
7 compared to those in year 2 (MD= 3.1, BCa 99% CI 0.4–5.7; $d=0.23$).

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9 Educational need

10 Two hundred and thirty-nine participants (37.9%, 95% CI 34.1–41.8) said “Yes” more training was
11 required for seizures.

12 The proportion saying more was required differed significantly for the presentations ($\chi^2(2)$
13 171.750, $p<0.001$). Specifically, more expressed a need for training on headache (44.5%, 95% CI 40.6–
14 48.5) than for seizures or breathing problems (17.0%, 95% CI 14.1–20.1). The proportion wanting more
15 on seizures was also higher than for breathing problems (Figure 1).

16 Those in year 2 were more likely to identify a need for more on seizures (44.2% vs 33.7% $\chi^2=$
17 7.141, $p=0.008$) than those in year 3 or beyond.

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19 DISCUSSION

20 Main findings

21 Interventions to reduce AAs for seizures are sought. We undertook what is, to our knowledge, the
22 largest survey of UK student paramedics to understand the potential utility of enhancements to pre-
23 registration education for paramedics.

24 Results suggest the magnitude of benefit may be lower than anticipated. Whilst studies with
25 practising paramedics signal low confidence for managing seizures,[15-18] our student participants
26 expressed high confidence. Conveyance decisions are a case in point – 45% of students rated

1 themselves as being extremely/very confident. Only 27% of practising ambulance clinicians said this
2 when asked by Kinney.[18]

3 What was notable was the confidence students reported was not dissimilar to that which they
4 expressed for breathing problems – a presentation frequently seen by paramedics,[1, 2] for which
5 conveyance decisions are known to reasonably accurate.[3] Students' confidence for managing
6 seizures was also higher than for headaches. As might be anticipated,[19] confidence for seizures was
7 higher for those later on in their training.

8 So, what might explain the high confidence of students? It could be due to the
9 professionalisation of paramedics and the recent shift in their education from a largely vocational,
10 short model of training to a longer, higher education model. Reasons for the shift included concerns
11 that the vocational model fostered focused on lifesaving conditions and that there was a need for
12 paramedics to be more autonomous and able to decide whether patients can be assessed and treated
13 in their own homes or require transport to hospital.[26] Our findings may suggest the move is
14 achieving its goal. Previous studies have suggested differences in the decision making[27, 28] of those
15 qualifying by the vocational and higher education routes.

16 An alternative explanation relates to how students' readiness was determined. They self-
17 assessed it. Whilst practical and widely used, it remains unclear how accurately people, including
18 student paramedics,[28, 29] can assess their abilities. Evidence from the wider literature, such as on
19 the Dunning-Kruger cognitive bias,[30] indicates those who perform best on some objective
20 assessment may underestimate their performance, while lower performers can overestimate it. Also
21 of potential relevance is the 'theory–practice' gap.[31] Specifically, when trainees qualify and seek to
22 apply their theoretical knowledge to the complexity of the workplace and make decisions their
23 confidence may diminish. We did not ask participants what clinical exposure they had with seizures.
24 A previous report noted students spend ~1625 hours on clinical practice hours over a 3-year
25 programme.[32] What they encounter will though, vary. Future studies should explore what, if any
26 relevance, such phenomenon have.

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Implications

If participants' perceived readiness reflects actual readiness, then approximately a third of our participants called for further pre-registration education on seizures. It remains unclear whether the expressed need justifies a change to pre-registration provision. This is a judgement that the wider community and stakeholders need to take a view on. It is possible that some of the need might be addressed by the time participants have completed more of their existing pre-registration programme.

Another issue that stakeholders should consider is the lower sense of readiness for managing seizures reported by those training via an apprenticeship compared to those who were university-based. To our knowledge, this is the first comparison of students from the different pathways. Why the difference exists is unknown. Might it be due to systematic differences in how the pathways are education persons on seizures? Curriculum guidance for courses is available.[19] Exact provision though, is at provider discretion. There may be an opportunity here for providers to share best practice.

Overall, our results suggest modification to pre-registration education alone may not be sufficient to address the sizeable number of AAs for seizures. Thus, other interventions should be considered. A range of macro, meso and micro factors potentially influence conveyance decisions[33] and work is underway to address some. One factor which has not been addressed is the minimal sharing of information between seizure specialists and emergency care providers. Consequently, clinicians in the out-of-hospital setting have limited access to information on the baseline health of the person they are seeing and referrals of patients to seizure specialists following contact with urgent emergency care providers remain patchy.[4]

Limitations

1 The sample for our, albeit cross-sectional, survey was large – representing ~10% of those studying in
2 the UK to be a paramedic who were in year 2 or beyond at the time.[34] There was also minimal
3 attrition. Limited evidence is available on the characteristics of student UK paramedics. Subject level
4 data[34] at least indicates that the our sample was representative with regards sex. It is unknown,
5 however, whether those studying via an apprenticeship were underrepresented.

6 Subsequent studies should consider using additional measures to assess perceived confidence
7 to permit them to understand things in a more granular way. This is because the one we used, whilst
8 comprising of questions on perceived knowledge of, ability to care for and confidence to care, only
9 generates an overall confidence score. Also, it was not possible via the measures we used to directly
10 compare and contrast confidence to care overall with confidence to specifically make a conveyance
11 decision. Their scales were different.

12

13 **CONCLUSIONS**

14 Student paramedics report relatively high perceived readiness to manage seizures, with a minority
15 requesting further education. It is likely that enhancements to pre-registration education alone will
16 not be sufficient to address the sizeable number of AAs for seizures.

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1 LIST OF ABBREVIATIONS

2 AA: avoidable attendance

3 BCa: bias-corrected and accelerated bootstrap

4 BSc: Bachelor of Science

5 ED: emergency department

6 IQR: interquartile range

7 M: mean

8 MD: mean difference

9 Mdn: median

10 MSc: Master of Science

11 POMP: percentage of maximum possible

12 SD: standard deviation

13 UK: United Kingdom

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1 **DECLARATIONS**

2 **Ethics approval and consent to participate:** This research was conducted in accordance with the
3 Declaration of Helsinki. Ethical approval for its conduct was provided by the University of Liverpool's
4 Ethics Committee (Ref: 11962). All participants provided informed consent.

5

6 **Consent for publication**

7 Not applicable.

8

9 **Availability of Data and Materials**

10 Anonymised data are available on reasonable request (from the corresponding author).

11

12 **Competing interests**

13 All authors have completed the ICMJE uniform disclosure form at <http://www.icmje.org/disclosure->
14 [of-interest/](http://www.icmje.org/disclosure-of-interest/) and declare: AM and PD were supported by the National Institute for Health Research
15 Applied Research Collaboration North West Coast (ARC NWC) and Marson is an NIHR Senior
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18 previous three years; no other relationships or activities that could appear to have influenced the
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26 those of the National Institute for Health Research or the Department of Health and Social Care.

1 Moreover, the sponsor had no role in the study design, data collection, analysis, interpretation, writing
2 of the report or the decision to submit the article for publication.

3

4 **Authors' Contributions**

5 All authors made substantial contributions to the conception or design of the work; or the acquisition,
6 analysis, or interpretation of data for the work. AN, CL, PD, AM, LA, HI and CB developed the study
7 design and methodology. AN, LA, HI and CB conducted the data management and formal analysis,
8 with AM, PD and KH providing critical advice on interpretation. AN wrote the first draft of the
9 manuscript with all remaining authors revising it critically for important intellectual content and
10 providing final approval of the version to be published. AN is the guarantor and accepts full
11 responsibility for the work and the conduct of the study, had access to the data, and controlled the
12 decision to publish. All authors provide agreement to be accountable for all aspects of the work in
13 ensuring that questions related to the accuracy or integrity of any part of the work are appropriately
14 investigated and resolved.

15

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22

23 **Authors information (optional)**

24 Not applicable

25

26

1 **FIGURE TITLES**

2

3 **FIGURE 1** Proportion of participants stating “yes” more pre-registration education was

4 required for the different presentations

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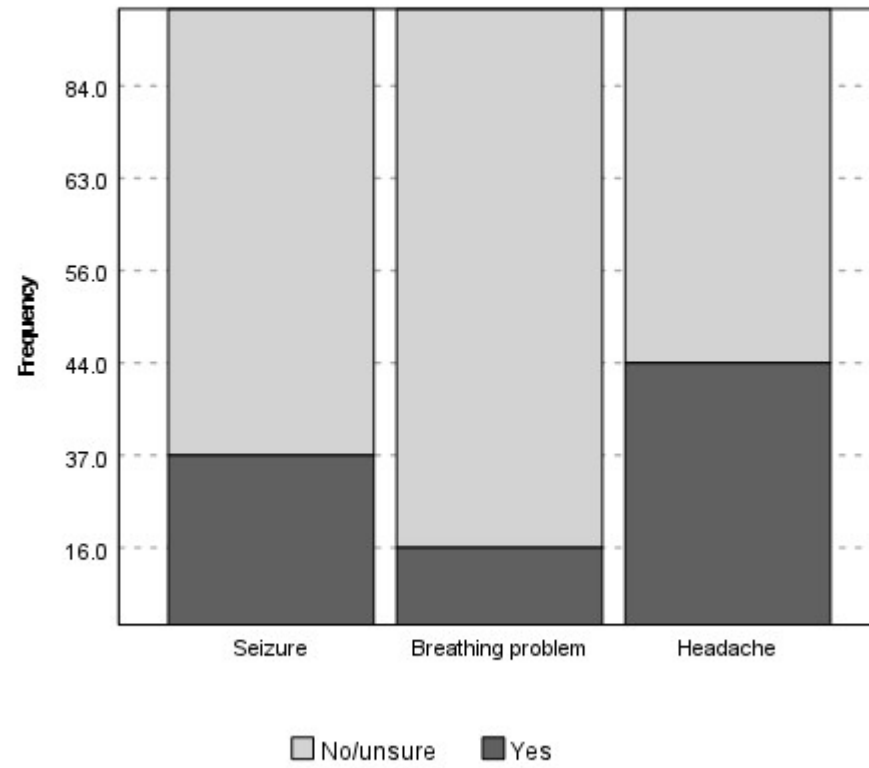
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12 **HECoS, level of study, first year marker, mode of study, domicile marker and academic**
13 **year** [<https://www.hesa.ac.uk/data-and-analysis/students/table-46.csv>
14 <https://www.hesa.ac.uk/data-and-analysis/students/table-52.csv>]

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ADDITIONAL FILE 1 Systematic literature search: Methods and summary of studies

Methods

Identification

Searches were made of PsycINFO, Medline and Scopus from inception until 10/10/2022. The following search terms (article titles, abstracts and keywords) were used and modified for the different databases:

1. pre-hospital OR paramedic OR ambulance
2. AND epilep* OR seizure OR convuls*
3. AND views OR experience OR training OR preparedness OR concerns OR readiness OR attitude OR behavi?ur OR knowledge OR belief

Eligibility and screening

To be eligible an article had to be reported in English, be published in a peer-reviewed journal and the study needed to have considered the views, experience, training, preparedness, concerns, readiness, attitudes, behaviour, knowledge or belief of paramedics on epilepsy or seizures in humans.

Titles/abstracts for identified articles were screened for eligibility by two reviewers (LA & HI), removing duplicates and obviously irrelevant studies. Full texts versions of the articles that they both agreed as ostensibly eligible were accessed and further reviewed for eligibility by both reviewers. Agreement between them was high (91%) and the one discrepancy was resolved through discussion.

Results

The selection process and reasons for exclusion are shown in the PRISMA flow chart below. Ultimately 8 eligible studies were identified. They are summarised in the Table. None of the studies involved trainee paramedics from the United Kingdom (UK).

Figure

PRISMA Flow chart showing identification and selection assessment

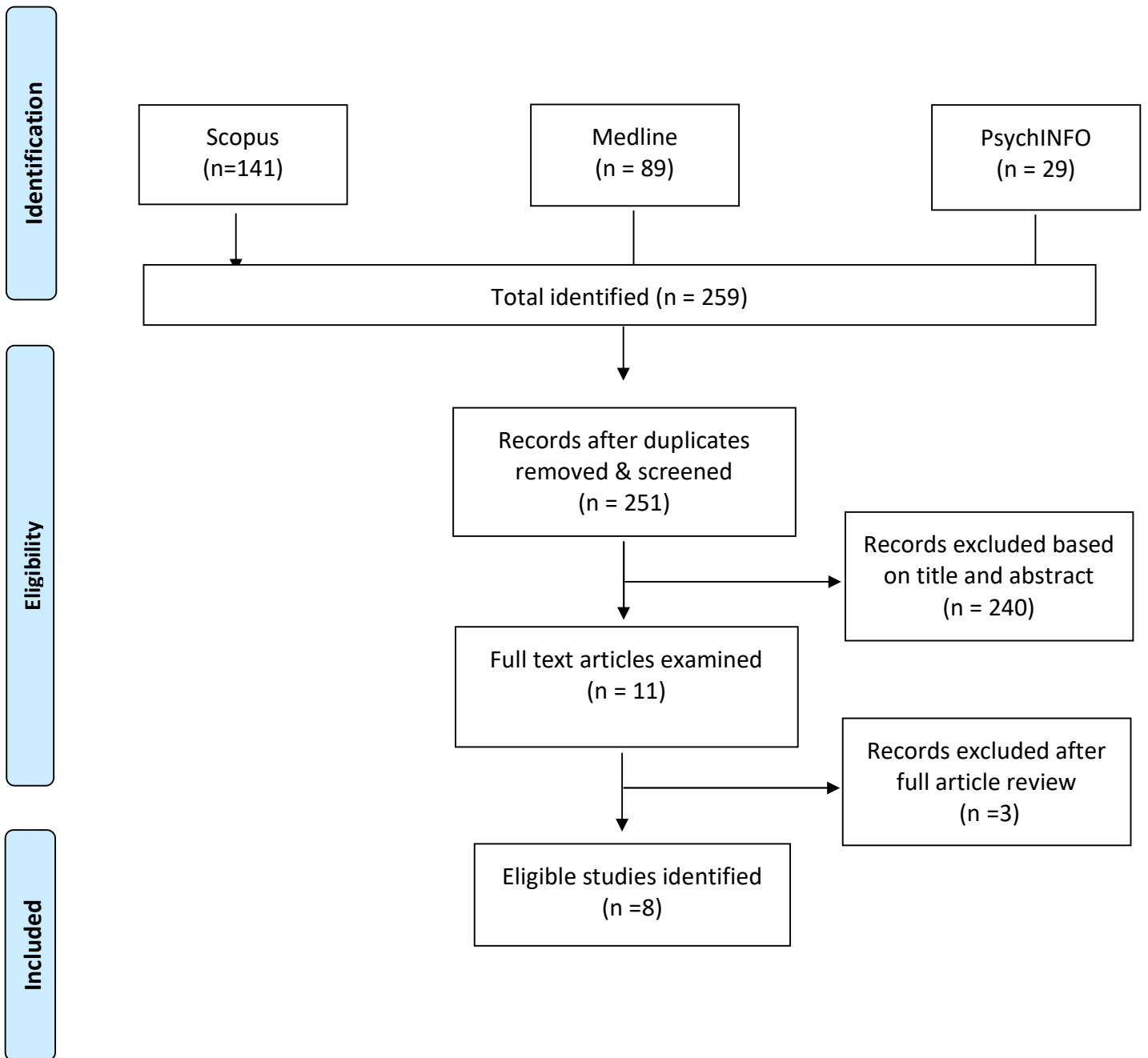


Table Summary of findings from eligible studies identified by systematic search

Authors	Country	Sample				Method/s	Key findings
		<i>Number of ambulance clinicians included</i>	<i>Did sample include any trainees?</i>	<i>What pre-registration training had participants typically completed?</i>	<i>Years participants qualified for</i>		
Burrell et al. [1]	UK	15	No.	Vocational	Median 6 (IQR 2 to 11)	Semi-structured interview.	<ul style="list-style-type: none"> -Half said they lacked confidence making conveyance decisions. - Self-resolved epileptic seizures Identified as particularly challenging. - Insufficient training and guidance reported. - Higher confidence ascribed to experience, not training.
Ernest et al. [2]	USA	Not specified.	Indirectly	Not specified	Not specified	A retrospective review of 71,683 cases seen by trainee paramedics during preceptorship.	<ul style="list-style-type: none"> - Identified frequency of different presentations to ambulance service by 1-16 age. Suggests this needs to be accounted for in preceptorship training to ensure it provides sufficient exposure to prepare clinicians. - Seizures were less common in paediatric population with each year increase age. Most common in 0 to 2-year-old group.
Shah et al.[3]	USA	Not specified.	No	Not specified	Not specified	The medication management of 250 active seizing incidents (in in 1 to	<ul style="list-style-type: none"> - No statistically significant difference between groups detected on the primary outcome measures of administration of dextrose for hypoglycaemia or midazolam for euglycemia.

						18 year olds) by paramedics who had and had not received additional training (PediSTEPPs) was compared. The PediSTEPPs training was delivered as part of a non-randomised trial.	
Noble et al.[4]	UK	19	No	Vocational	Mean 20 (SD=9.6)	Semi-structured interview.	<ul style="list-style-type: none"> - Paramedics reported can often have limited confidence to manage seizures. - A range of factors, including limited training, stated as influencing conveyance decisions beyond patient need and create a momentum for patients to be conveyed to emergency departments.
Sherratt et al.[5]*	UK	19	No	Vocational	Mean 20 (SD=9.6)	Semi-structured interview.	<ul style="list-style-type: none"> - Paramedics said seizure management had been 'neglected' within both pre- and post-registration training. - They reported this often leads to low seizure management knowledge and confidence among paramedics.

Kinney et al.[6]	UK	47	No	Vocational	Mean 11.5 (range 2 to 27]	Structured questionnaire	<ul style="list-style-type: none"> - Paramedics rated their confidence for managing seizures. It was lowest for recognizing different seizure types (including non-epileptic attack disorder) and for making conveyance decisions. - Training was not commonly cited as being key to any high confidence, rather experience and protocols were.
Carey et al.[7]	USA	66	No	Not specified	10.6 (SD 5.6)	Semi-structured interview	<ul style="list-style-type: none"> - Paramedics, who had recently transported actively seizing 0–17-year-old patients reported enablers and barriers to protocol adherent care for paediatric patients. - Limited paediatric specific training was one of a range of system level barriers identified. Provider-level barriers were also identified.
Lammers et al.[8]	USA	147	No	Not specified	Median range across groups 4 to 7.2	As part of a randomised controlled trial, the effect of 3 different educational interventions on paramedics ability to manage a range of paediatric presentations was assessed. Seizure	<ul style="list-style-type: none"> - Paediatric seizure management ability significantly improved compared to baseline for persons in each of the interventional educational groups. - Percentage score improvement ranged from +11 to +15% across different educational groups. - Ability did not significantly improve in the control group (score improvement +4.5%).

						<p>was one of the presentations</p> <p>Outcome measure was a validated, performance-based, simulated clinical assessment.</p>	
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Notes: IQR, interquartile range; PediSTEPPs, Pediatric Simulation Training for Emergency Prehospital Providers; UK, United Kingdom; US, United States of America; SD, standard deviation; * Study used same data set as Noble et al.. Sherratt et al. reported on at educational needs, whilst Noble et al. primarily reported seizure care experiences.

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ADDITIONAL FILE 2 Higher Education Institutions within UK that did and did not circulate invite and their characteristics

	Was advert circulated at HEI site?					
	Yes			No		
	<i>Provider name</i>	<i>Country</i>	<i>Number of years eligible to participate across approved courses offered</i>	<i>Provider name</i>	<i>Country</i>	<i>Number of years eligible to participate across approved courses offered</i>
1.	Birmingham City University	England	Two (Years 2, 3)	Anglia Ruskin University	England	Two (Years 2, 3)
2.	Bournemouth University	England	Two (Years 2, 3)	Canterbury Christ Church University	England	Two (Years 2, 3)
3.	Buckinghamshire New University	England	One (Year 2)	Coventry University	England	Two (Years 2, 3)
4.	De Montfort University	England	Two (Years 2, 3)	Keele University	England	One (Year 2)
5.	Edge Hill University	England	Three (Years 2, 3, 4)	Sheffield Hallam University	England	Two (Years 2, 3)
6.	Liverpool John Moores University	England	Two (Years 2, 3)	St George's, University of London	England	Two (Years 2, 3)
7.	Nottingham Trent University	England	Two (Years 2, 3)	Staffordshire University	England	Two (Years 2, 3)
8.	Oxford Brookes University	England	Two (Years 2, 3)	The University of Northampton	England	Two (Years 2, 3)
9.	Teesside University	England	Two (Years 2, 3)	University Huddersfield	England	One (Year 2)
10.	The University of Bolton	England	One (Year 2)	University of Bradford	England	Two (Years 2, 3)
11.	University of Bedfordshire	England	Two (Years 2, 3)	University of Gloucestershire	England	Two (Years 2, 3)
12.	University of Brighton	England	Two (Years 2, 3)	University of Hull	England	Two (Years 2, 3)
13.	University of Central Lancashire	England	Two (Years 2, 3)	University of Suffolk	England	Two (Years 2, 3)
14.	University of Cumbria	England	Two (Years 2, 3)	Queen Margaret University	Scotland	Two (Years 2, 3)
15.	University of East Anglia	England	Two (Years 2, 3)	University of the West of Scotland	Scotland	Two (Years 2, 3)
16.	University of Greenwich	England	Two (Years 2, 3)			
17.	University of Hertfordshire	England	Two (Years 2, 3)			
18.	University of Lincoln	England	Two (Years 2, 3)			
19.	University of Plymouth	England	Two (Years 2, 3)			
20.	University of Portsmouth	England	Two (Years 2, 3)			
21.	University of Sunderland	England	Two (Years 2, 3)			
22.	University of Surrey	England	Two (Years 2, 3)			
23.	University of the West of England	England	Two (Years 2, 3)			
24.	University of West London	England	Two (Years 2, 3)			
25.	University of Wolverhampton	England	Two (Years 2, 3)			

26.	University of Worcester	England	Two (Years 2, 3)			
27.	University of Ulster	N. Ireland	One (Year 2)			
28.	Glasgow Caledonian University	Scotland	Two (Years 2, 3)			
29.	Robert Gordon University	Scotland	Two (Years 2, 3)			
30.	University of Stirling	Scotland	Two (Years 2, 3)			
31.	Swansea University	Wales	Two (Years 2, 3)			
		England: 26 (83.9%) Scotland: 3 (9.7%) Wales: 1 (3.2%) N. Ireland: 1 (3.2%)	One: 3 (9.7%) Two: 27 (87.1%) Three: 1 (3.2%)		England: 13 (86.7%) Scotland: 2 (13.3) Wales: 0 N. Ireland: 0	One: 2 (13.3%) Two: 13 (86.7%) Three: 0

Notes HEI, Higher Education Institute; N., Northern

ADDITIONAL FILE 3 Full survey*

* Note that the actual order in which presentation were asked about was randomised.

Start of Block: Landing page with welcome, logo and embedded link for information sheet

As the next generation of paramedics, it is important to understand what can be done to help trainees feel ready for practice. University of Liverpool and Liverpool John Moores University are therefore doing a survey.

It only takes 5 to 10 minutes. The first 300 people submitting a complete response each get a £5 voucher.

The survey asks trainees how they feel programmes are preparing them and if any changes are required.

You can take part if you:

- Are aged 16 years or over.
- Are enrolled on an HCPC approved paramedic training programme.
- Are able to complete a survey in English by yourself
- Do not have a terminal illness or severe psychiatric condition
- Live in the UK
- People in all years of study can take part (except those in year 1, sorry!).

A participant information form, with more details about the study, can be found [HERE](#)

If any help is required while completing the study, please email us at sz.res.group@liverpool.ac.uk

This study has been reviewed and approved by the University of Liverpool Research Ethics Committee (REF: 11962).



To take part in the study you need to agree to the following things:

- I confirm that I have read the information sheet dated 28.10.22 (v1.0) for the above study. (1)
- I confirm that I am suitable to take part in the study. (2)
- I have had the opportunity to consider the information and any questions I had have been answered satisfactorily. (3)
- I understand that my participation is voluntary. I am free to withdraw at any time without giving any reason, and that this will not affect my studies or training. (4)
- I have the ability to decide for myself whether I do or do not want to take part in the study. (5)
- I agree to take part in the above study. (6)

End of Block: Landing page with welcome, logo and embedded link for information sheet

Start of Block: Participant characteristics

First, we would like to know a bit about you.

Please tell us your current age in years.

I am... (select the option that applies)

▼ 16 (1) ... 80 and above (65)

What is your sex? (This might be different to your gender identity)

- Male (1)
- Female (2)
- Prefer not to say (3)

How are you currently training to be a paramedic?

I am... (select the option that applies)

- On an approved course in paramedic science at a university (1)
- Completing a degree level apprenticeship in paramedic science with an ambulance service (2)
- Other - please describe: (3)

Have you ever worked as an Emergency Medical Technician (EMT) (either as part of your current training or as a profession before starting it?)

- Yes (1)
- No (2)



What year of training are you currently in?

I am currently in... (select the option that applies)

- Year 1 (1)
 - Year 2 (2)
 - Year 3 (3)
 - Year 4 (4)
-

In which country are you training in?

- England (1)
- Wales (2)
- Scotland (3)
- Northern Ireland (4)

Display This Question:

If In which country are you training in? = England

In which English region are you mostly training in?

- Yorkshire and the Humber (e.g., Leeds, etc.) (1)
- West Midlands (e.g., Birmingham, etc.) (2)
- South West (e.g., Taunton, etc.) (3)
- South East (e.g., Guildford, etc.) (4)
- North West (e.g., Liverpool, Manchester, etc.) (5)
- London/Greater London (6)
- East of England (e.g., Flempton, etc.) (7)
- East Midlands (e.g., Nottingham, etc.) (8)

End of Block: Participant characteristics

Start of Block: Knowledge

We would now like to ask you about your sense of preparedness to manage three different presentations.

Firstly, we would like to ask you about your knowledge of each of them.

End of Block: Knowledge

Start of Block: Knowledge of seizure presentations

The presentation we are focusing on here is seizures.

Please tell us how much you agree or disagree with each of the following statements
(select your choices from the drop-down menus):

My knowledge of seizure patients is comprehensive.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

I am able to recognise different types of seizure presentations.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

I am knowledgeable on how to assess and treat a patient presenting with a seizure problem in the prehospital setting.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

My knowledge of the different types of seizure presentations is poor.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

I am easily able to recognise when a patient is presenting with a seizure problem.

- 1 = Strongly disagree (1)
- 2 = Disagree (2)
- 3 = Neutral (3)
- 4 = Agree (4)
- 5 = Strongly agree (5)

End of Block: Knowledge of seizure presentations

Start of Block: Knowledge of breathing problem presentations

The presentation we are focusing on here is breathing problems.

Please tell us how much you agree or disagree with each of the following statements
(select your choices from the drop-down menus):

My knowledge of breathing problem patients is comprehensive.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

I am able to recognise different types of breathing problems presentations.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

I am knowledgeable on how to assess and treat a patient presenting with a breathing problem in the prehospital setting.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

My knowledge of the different types of breathing problem presentations is poor.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

I am easily able to recognise when a patient is presenting with a breathing problem.

- 1 = Strongly disagree (1)
- 2 = Disagree (2)
- 3 = Neutral (3)
- 4 = Agree (4)
- 5 = Strongly agree (5)

End of Block: Knowledge of breathing problem presentations

Start of Block: Knowledge of headache presentations

The presentation we are focusing on here is headaches.

Please tell us how much you agree or disagree with each of the following statements
(select your choices from the drop-down menus):

My knowledge of headache patients is comprehensive.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

I am able to recognise different types of headache presentations.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

I am knowledgeable on how to assess and treat a patient presenting with a headache problem in the prehospital setting.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

My knowledge of the different types of headache presentations is poor.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

I am easily able to recognise when a patient is presenting with a headache problem.

- 1 = Strongly disagree (1)
- 2 = Disagree (2)
- 3 = Neutral (3)
- 4 = Agree (4)
- 5 = Strongly agree (5)

End of Block: Knowledge of headache presentations

Start of Block: Perceived ability to provide care

We would now like to ask you about your perceived ability to provide care for the different presentations.

Please tell us how much you agree or disagree with each of the following statements
(select your choices from the drop down menus):

End of Block: Perceived ability to provide care

Start of Block: Perceived ability to provide care for seizure presentations

The presentation we are focusing on here is seizures.

I believe my training is preparing me well to provide care that helps seizure patients.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

If I were to attend to a seizure patient, I know how to provide management/treatment that will assist the patient's condition.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

I believe my education and training is preparing me well to provide care that benefits seizure patients.

- 1 = Strongly disagree (1)
- 2 = Disagree (2)
- 3 = Neutral (3)
- 4 = Agree (4)
- 5 = Strongly agree (5)

End of Block: Perceived ability to provide care for seizure presentations

Start of Block: Perceived ability to provide care for breathing problem presentations

The presentation we are focusing on here is breathing problems.

I believe my training is preparing me well to provide care that helps breathing problem patients.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

If I were to attend to a breathing problem patient, I know how to provide management/treatment that will assist the patient's condition.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

I believe my education and training is preparing me well to provide care that benefits breathing problem patients.

- 1 = Strongly disagree (1)
- 2 = Disagree (2)
- 3 = Neutral (3)
- 4 = Agree (4)
- 5 = Strongly agree (5)

End of Block: Perceived ability to provide care for breathing problem presentations

Start of Block: Perceived ability to provide care for headache presentations

The presentation we are focusing on here is headaches.

I believe my training is preparing me well to provide care that helps headache patients.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

If I were to attend to a headache patient, I know how to provide management/treatment that will assist the patient's condition.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

I believe my education and training is preparing me well to provide care that benefits headache patients.

- 1 = Strongly disagree (1)
- 2 = Disagree (2)
- 3 = Neutral (3)
- 4 = Agree (4)
- 5 = Strongly agree (5)

End of Block: Perceived ability to provide care for headache presentations

Start of Block: Confidence

Finally, we would like you to tell us how confident you think you would be in managing the presentations.

Please tell us how much you agree or disagree with each of the following statements
(select your choices from the drop down menus):

End of Block: Confidence

Start of Block: Confidence towards seizure presentations

The presentation we are focusing on here is seizures.

I am, or believe I would be, very confident when attending a patient presenting with a seizure problem.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

I do, or believe I would, feel anxious when attending a patient presenting with a seizure problem.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

I do, or believe I would, feel stressed when called to a patient presenting with a seizure problem.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

I feel confident that I can/could assess and treat a patient with a seizure problem to a high standard.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

I would feel comfortable in my ability if I were to attend a patient with a seizure problem.

- 1 = Strongly disagree (1)
- 2 = Disagree (2)
- 3 = Neutral (3)
- 4 = Agree (4)
- 5 = Strongly agree (5)

End of Block: Confidence towards seizure presentations

Start of Block: Confidence towards breathing problem presentations

The presentation we are focusing on here is **breathing problems**.

I am, or believe I would be, very confident when attending a patient presenting with a **breathing problem**.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

I do, or believe I would, feel anxious when attending a patient presenting with a **breathing problem**.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

I do, or believe I would, feel stressed when called to a patient presenting with a breathing problem.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

I feel confident that I can/could assess and treat a patient with a breathing problem to a high standard.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

I would feel comfortable in my ability if I were to attend a patient with a breathing problem.

- 1 = Strongly disagree (1)
- 2 = Disagree (2)
- 3 = Neutral (3)
- 4 = Agree (4)
- 5 = Strongly agree (5)

End of Block: Confidence towards breathing problem presentations

Start of Block: Confidence towards headache presentations

The presentation we are focusing on here is headaches.

I am, or believe I would be, very confident when attending a patient presenting with a headache problem.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

I do, or believe I would, feel anxious when attending a patient presenting with a headache problem.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

I do, or believe I would, feel stressed when called to a patient presenting with a headache problem.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

I feel confident that I can/could assess and treat a patient with a headache problem to a high standard.

- 1 = Strongly disagree (1)
 - 2 = Disagree (2)
 - 3 = Neutral (3)
 - 4 = Agree (4)
 - 5 = Strongly agree (5)
-

I would feel comfortable in my ability if I were to attend a patient with a headache problem.

- 1 = Strongly disagree (1)
- 2 = Disagree (2)
- 3 = Neutral (3)
- 4 = Agree (4)
- 5 = Strongly agree (5)

End of Block: Confidence towards headache presentations

Start of Block: Conveyance confidence

We would now like to ask you how confident you would say you would be in deciding whether or not to take people with the presentations to a hospital emergency department (ED) (select your choices from the drop-down menus):

End of Block: Conveyance confidence

Start of Block: Conveyance confidence for seizure presentations

How confident would you say you would be in deciding whether or not to convey a seizure patient to ED?

- 1 = Not at all confident (1)
- 2 = Slightly confident (2)
- 3 = Reasonably confident (3)
- 4 = Very confident (4)
- 5 = Extremely confident (5)

End of Block: Conveyance confidence for seizure presentations

Start of Block: Conveyance confidence for breathing problem presentations

How confident would you say you would be in deciding whether or not to convey a breathing problem patient to ED?

- 1 = Not at all confident (1)
- 2 = Slightly confident (2)
- 3 = Reasonably confident (3)
- 4 = Very confident (4)
- 5 = Extremely confident (5)

End of Block: Conveyance confidence for breathing problem presentations

Start of Block: Conveyance confidence for headache presentations

How confident would you say you would be in deciding whether or not to convey a headache patient to ED?

- 1 = Not at all confident (1)
- 2 = Slightly confident (2)
- 3 = Reasonably confident (3)
- 4 = Very confident (4)
- 5 = Extremely confident (5)

End of Block: Conveyance confidence for headache presentations

Start of Block: Pre-registration opinions

We would like to know whether you think your pre-registration should be giving more attention to the different presentations?

End of Block: Pre-registration opinions

Start of Block: Pre-registration opinions on seizure presentations

Do you think you should/should have received more training on seizures via your pre-registration programme?

- Yes (1)
- No (2)
- Unsure (3)

Display This Question:

*If Do you think you should/should have received more training on seizures via your pre-registration...
= Yes*

To create space for this, what do you think might be removed or there could be less of?

End of Block: Pre-registration opinions on seizure presentations

Start of Block: Pre-registration opinions on breathing problem presentations

Do you think you should/should have received more training on breathing problems via your pre-registration programme?

- Yes (1)
 - No (2)
 - Unsure (3)
-

Display This Question:

If Do you think you should/should have received more training on breathing problems via your pre-reg... = Yes

To create space for this, what do you think might be removed or there could be less of?

End of Block: Pre-registration opinions on breathing problem presentations

Start of Block: Pre-registration opinions on headache presentations

Do you think you should/should have received more training on headaches via your pre-registration programme?

- Yes (1)
 - No (2)
 - Unsure (3)
-

Display This Question:

If Do you think you should/should have received more training on headaches via your pre-registration... = Yes

To create space for this, what do you think might be removed or there could be less of?

End of Block: Pre-registration opinions on headache presentations

Start of Block: Experience of sustainable health care education and views on the role of the NHS

This is the final question of the survey.

Safely reducing the number of clinically unnecessary journeys to ED by ambulance is an NHS target. One possible consequence of fewer clinically unnecessary ambulance journeys to EDs would be fewer carbon emissions.

How important do you think it is for the health and care system to work in a way that supports the environment, such as improving resource efficiency, reducing carbon emissions and reducing waste?

- 1 = Strongly agree (1)
- 2 = Agree to some extent (2)
- 3 = Disagree to some extent (3)
- 4 = Strongly disagree (4)
- 5 = Don't know (5)

End of Block: Experience of sustainable health care education and views on the role of the NHS

Start of Block: End of the survey

You have now reached the end of the survey.

Shopping voucher:

The first 300 people who submit complete responses to the survey will each receive a £5 shopping voucher. If you would like to be considered for this, please enter your name and email address below:

Your name: (1) _____

Your email address: (2) _____

Some potentially helpful resources:

If you would like to know more about the 3 presentations focused upon by this survey we would direct you to: The College of Paramedic's E-Learning page (<https://collegeofparamedics.co.uk/COP/ProfessionalDevelopment/E-Learning.aspx>) The Joint Royal Colleges Ambulance Liaison Committee (JRCALC) guidelines (<https://aace.org.uk/clinical-practice-guidelines/>).

Whilst not directly related to the RISE survey, we are aware that studying can at times be challenging. We would therefore like to take the opportunity to highlight the following resources in case these are of interest:

<https://bluelighttogether.org.uk/ambulance/coping-with-student-life-for-trainee-paramedics/> <https://www.nhs.uk/mental-health/children-and-young-adults/help-for-teenagers-young-adults-and-students/student-stress-self-help-tips/>

https://collegeofparamedics.co.uk/COP/Member_/Paramedic_Mental_Health_and_Wellbeing.aspx

Thank you for submitting your answers. If you need to speak to someone about the study, you can contact the research team by emailing sz.res.group@liverpool.ac.uk

End of Block: End of the survey

ADDITIONAL FILE 4 Amendments made to items from Waltrich et al.'s perceived knowledge of, ability to care for and confidence to care questionnaire survey to make it suitable for use with trainee paramedics, rather than practicing paramedics

Subscale	Item as used within current study	Original item as used by Waltrich et al.
Knowledge of condition:		
1	'My knowledge X patients is comprehensive	No change
2	'I am able to recognise different types of X presentations	No change
3	'I am knowledgeable on how to assess and treat a patient presenting with a X problem in the prehospital setting'	No change
4	'My knowledge of the different types of X presentations is poor' (negatively coded)	No change
5	'I am easily able to recognise when a patient is presenting with a X problem'	No change
Ability to care:		
1	'I believe my training is preparing me well to provide care that helps X patients'	'I believe I am able to provide care that helps X patients'
2	'If I were to attend to a X patient, I know how to provide management/treatment that will assist the patient's condition'	'When attending a X patient, I know how to provide management/treatment that will assist the patient's condition'
3	'I believe my education and training is preparing me well to provide care that benefits X patients'	'I believe my education and training enables me to provide care that benefits X patients'
4	-	Excluded item: 'The care I provide to X patients provides benefit and improves their condition'
5	-	Excluded item: 'The care I can provide X patients is limited and rarely beneficial for the patient' (negatively coded)
Confidence to care:		
1	'I am, or believe I would be, very confident when attending a patient presenting with a X problem'.	'I am very confident when attending a patient presenting with a X problem'.

2	'I do, or believe I would, feel anxious when attending a patient presenting with a X problem' (negatively coded)	'I feel anxious when attending a patient presenting with a X problem' (negatively coded)
3	'I do, or believe I would, feel stressed when called to a patient presenting with a X problem' (negatively coded)	'I feel stressed when called to a patient presenting with a X problem' (negatively coded)
4	'I feel confident that I can/could assess and treat a patient with a X problem to a high standard'	'I feel stressed when called to a patient presenting with a X problem' (negatively coded)
5	'I would feel comfortable in my ability if I were to attend a patient with a X problem'	'I feel comfortable in my ability when attending a patient with a X health problem'