Establishing the Research Priorities of Paediatric Emergency Medicine Clinicians in the United Kingdom & Ireland

Hartshorn S, O'Sullivan R, Maconochie IK, Bevan C, Cleugh F, Lyttle MD

Stuart Hartshorn, MA MB BChir FRCPCH
Emergency Department, Birmingham Children's Hospital, Birmingham, UK

Ronan O'Sullivan MB BCh BAO FRCSI FCEM FPAEDS MBA
School of Medicine, University College Cork, Cork, Ireland;
Paediatric Emergency Research Unit (PERU), National Children's Research Centre, Dublin 12, Ireland

Ian K Maconochie, FRCPCH FRCPI FCEM PhD
Emergency Department, St Mary's Hospital, Imperial College NHS Healthcare Trust, London, UK

Catherine Bevan, MBBS MRCPCH FRACP
Emergency Department, Royal Alexandra Children's Hospital, Brighton, UK

Francesca Cleugh, MBChB MRCPCH
Emergency Department, Imperial College Healthcare NHS Trust, London, UK

Mark D Lyttle, MBChB MRCPCH FCEM
Emergency Department, Bristol Royal Hospital for Children, Bristol, UK
Academic Department of Emergency Care, University of the West of England, Bristol, UK

ON BEHALF OF PERUKI

Corresponding author:
Stuart Hartshorn
Emergency Department
Birmingham Children's Hospital NHS Foundation Trust
Steelhouse Lane
Birmingham
United Kingdom
B4 6NH

0121 333 9515
stuart.hartshorn@bch.nhs.uk

ABSTRACT

Objective

Paediatric Emergency Research in the UK and Ireland (PERUKI) is a collaborative clinical studies group, established in August 2012. It consists of a network of 43 centres from England, Ireland, Northern Ireland, Scotland and Wales, and aims to improve the emergency care of children through the performance of robust collaborative multicentre research within Emergency Departments (EDs).

A study was conducted regarding the research priorities of PERUKI, to establish the research agenda for paediatric emergency medicine (PEM) in the UK and Ireland.

Methods

A 2-stage modified Delphi survey was conducted of PERUKI members via an online survey platform. Stage 1 allowed each member to submit up to 12 individual questions that they identified as priorities for future research. In stage 2, the shortlisted questions were rated each on a 7-point Likert scale of relative importance.

Participants

Members of PERUKI, including clinical specialists, academics, trainees and research nurses.

Results

Stage 1 surveys were submitted by 46/91 PERUKI members (51%). A total of 249 research questions were generated and, following the removal of duplicate questions and shortlisting, 60 questions were carried forward for stage 2 ranking. Stage 2 survey responses were submitted by 58/95 members (61%). For the 60 research questions that were rated, the mean score of "relative degree of importance" was 4.70 (range 3.36 – 5.62, SD 0.55).

After ranking, the top ten research priorities included questions on biomarkers for serious bacterial illness, major trauma, intravenous bronchodilators for asthma, and decision rules for fever with petechiae, head injury and atraumatic limp.

Conclusions

Research priorities of PERUKI members have been identified. By sharing these results with clinicians, academics and funding bodies, future research efforts can be focused to the areas of greatest need.

WHAT IS ALREADY KNOWN ON THIS TOPIC

- Paediatric emergency medicine (PEM) research networks outside of the UK & Ireland have established priorities of their members in order to define their research agenda.

- There is a national agenda to increase involvement of children in research studies, but with limited time and financial resources this must be focused to areas of greatest need.

WHAT THIS STUDY ADDS

- The research priorities of PEM clinicians in the UK and Ireland are identified, enabling focused research on key areas.

- Methodology is described which could be adopted by other clinician groups to establish research priorities in different specialty areas.

INTRODUCTION

The volume of children attending Emergency Departments (EDs) with presentations encompassing the full spectrum of illnesses and injuries should create an ideal environment in which to perform research. Such opportunities must not be wasted, particularly given that parents/carers generally have a positive attitude to the potential recruitment of their children into clinical trials.[1] However, research in paediatric emergency medicine (PEM) brings with it the challenges of both the impediments of the ED clinical environment (activity, unpredictability, noise, time-critical patient management) and the limitations of research involving children.[2]

There has been infrequent utilisation of the significant numbers of paediatric attendances to EDs of the UK & Ireland to conduct research that can provide answers to important clinical questions, owing to the complexities of organising collaborative work. As a result, the majority of PEM studies within these nations have traditionally been performed in a small number of institutions, often single-centre in nature.

In contrast, other countries have had more success in conducting multicentre PEM research, largely thanks to the formation of PEM research networks. These include the Pediatric Emergency Medicine Collaborative Research Committee and the Pediatric Emergency Care Applied Research Network (PEMCRC and PECARN, US), Paediatric Emergency Research Canada (PERC), Paediatric Research in Emergency Departments International Collaborative (PREDICT, Australia/New Zealand) and Research in European Paediatric Emergency Medicine (REPEM). The existence of these networks led to the creation of Pediatric Emergency Research Networks (PERN), a research initiative formed with the vision of answering globally relevant PEM research questions.[3]

Paediatric Emergency Research in the United Kingdom and Ireland (PERUKI) was established in August 2012 as a collaborative clinical studies group among individuals passionate about providing high quality PEM research.[4] From its inception, many lessons were learned from looking at the

principles adhered to by other PEM research networks, with the aims of overcoming the inherent challenges of conducting studies, and increasing PEM research in line with the national agenda for the greater involvement of children in research.[5] PERUKI's vision is to improve the emergency care of children by the translation of findings of robust collaborative multicentre research in the emergency care system through UK and Ireland EDs. The PERUKI network consists of 43 member sites from the five nations of the UK & Ireland, comprising both paediatric-specific and mixed adult/paediatric EDs, within urban and rural locations. Individual membership is open to all practitioners with an enthusiasm for PEM research, including specialists, academics, trainees and research nurses. The PERUKI Executive Committee, elected by PERUKI members, consists of five PEM consultants (with consultant experience ranging from 3 to 16 years) and one PEM trainee, all of whom are active in research.

Soon after PERUKI was established, it was recognised that there was an urgent need to determine the research priorities of its members in order to set the research agenda for PEM in the UK and Ireland. A prioritisation exercise was therefore conducted using a modified-Delphi technique. This paper describes the methodology of that process and reports the research priorities that were identified.

METHODS

The work consisted of an initial survey in which all PERUKI members were invited to submit research questions. This bank of questions was then refined and resultant questions were distributed to the membership for priority ranking. This modified Delphi process has been used by other groups of clinicians for the purpose of establishing research priorities.[6] Classic Delphi methodology involves two or more survey rounds, with each participant receiving the replies of each participant, before being asked to reconsider their own answers, with the aim of achieving consensus.[7] The modified Delphi process used in this study relied on a small group to extract specific submissions from the initial survey round.

Stage 1A: Survey to identify important research questions

An online survey was composed using Bristol Online Surveys[TM]. This survey consisted of a single question: *"Thinking about your clinical practice in the field of paediatric emergency medicine, what are the most important research questions which need addressing?"* Each respondent could enter up to 12 research questions and, for each, the respondent was required to categorise the question from a pre-populated list of common topic areas. This approach had two purposes: (i) it aided with subsequent results analysis; and (ii) by providing a list of themes (ranging from analgesia and sedation, to gastroenterology, to education and training), this stimulated research ideas. Respondents were asked, where possible, to submit questions in standard "PICO" (population, intervention, control, outcome) format, and an example question was provided that illustrated this structure.

This survey was open for three weeks. At study commencement, 87 individuals were registered as members of the PERUKI network, with a further 4 clinicians registering during the period that the study was open, and these new members were also invited to undertake the survey (total distribution = 91 members). Reminders and progress updates were sent by email one week and two weeks after opening the online survey, and 24 hours prior to its closing. Respondents were given the option to either respond anonymously, or provide their email address within their submission. This ensured that (i) an open environment was created for sharing of ideas and (ii) further clarification could be sought where necessary for any proposed research questions.

Stage 1B: Refinement of research questions

A list of all unique research questions was compiled, grouped according to different topic areas. These questions were reviewed, discussed and refined by the PERUKI Executive Committee, generating a shortlist of research questions for ranking in the second stage. A question was

considered eligible if it had not already been answered within the scientific literature, and if the question leant itself to multi-centre research within the ED setting. Some questions, felt to be ineligible owing to an established evidence base, were identified for the future development of review articles to address knowledge gaps. In some cases, similar or related research questions were merged into a single research question that was carried forward to the second stage survey.

Stage 2A: Ranking of research questions

The second stage survey was conducted using the same online survey platform. This survey was sent via email to all PERUKI members, which by this time had increased to a total of 95 individuals, irrespective of whether they had submitted responses to the stage 1 survey. Within the stage 2 survey, members were asked to review each of the shortlisted research questions and rate each of them on a 7-point Likert scale ('not a priority' to 'essential priority'), based on the importance of the question to their own clinical practice in PEM. The survey remained open for a period of three weeks. Reminders and progress updates were sent by email after one week and two weeks of the survey opening, and 24 hours prior to the survey closing.

Stage 2B: Analysis and prioritisation

The questions considered in stage two were then ranked according to the total priority score.

ETHICS

The study was discussed with local Research & Innovation representatives, and formal research ethics committee approval was deemed unnecessary due to the setting and mode of identification of participants, and the nature of the study.

RESULTS

Stage 1 survey

Completed surveys were submitted by 46/91 members (51% response rate). A total of 249 research questions were generated, representing a mean of 5.4 questions (median 5 questions, range 1 – 12 questions SD 3.23) per respondent. Following the removal of duplicate questions, 206 unique research questions were available for further refinement. These included questions from 22 topic areas – the topics that yielded the most questions were analgesia and sedation, service planning, minor injuries (including minor head injuries), respiratory problems and major trauma (table 1).

Table 1: **Number of questions from stage 1 survey (listed by topic area, ranked by number of questions submitted)**

Topic	Number of questions submitted in Stage 1 survey	Number of unique questions from Stage 1 survey (after removal of duplicate questions)	Number of questions shortlisted for Stage 2 ranking
Analgesia & Sedation	27	24	3
Service Planning	24	24	9
Minor Injuries/Head injuries	23	16	6
Respiratory	23	17	4
Major Trauma	19	16	6
Orthopaedics & Fractures	19	13	4
Infectious Diseases	16	15	7
Shock & Critical Care	14	13	5
Gastroenterology	13	10	1
Patient Safety	11	9	2
Toxicology	9	4	3
Neurology & Neurosurgery	8	8	3
Epidemiology	7	7	0
Education	7	5	0
Psychiatry	6	4	2
Allergy & Immunology	4	4	1
Endocrinology/Metabolic	4	3	1
Nephrology & Urology	4	4	1
Safeguarding	4	3	2
Radiology	3	3	0

ENT	2	2	0
Cardiology	1	1	0
Ophthalmology	1	1	0
Total	**249**	**206**	**60**

43% (88/206) were deemed eligible questions to be carried forward to the second stage. There was some overlap between questions. These were merged and reworded to produce a final shortlist of 60 research questions. Table 1 shows the number of research questions, by topic, generated in stage 1A and subsequently shortlisted for ranking. Of the remainder, some were excluded because they had already been answered in the literature (42/206, 20%), for example, questions about the effectiveness of wrist splints for immobilisation of distal forearm buckle fractures. Ten topics were identified for the future development of review articles, when there was an apparent knowledge gap amongst multiple survey responders. Other proposed research questions (76/206, 37%) were not felt to be amenable for study in the environment of EDs, or else were felt to be more applicable to research by other specialty areas. In some cases (for example, research relating to education theory) it was acknowledged that PERUKI alone might not be able to answer the proposed questions, but in future a working group within PERUKI with a particular interest could collaborate with external groups with specialist knowledge.

Stage 2 survey

Stage 2 surveys were submitted by 58/95 PERUKI members (61% response rate). For the 60 research questions that were rated, the mean score of "relative degree of importance" was 4.70 (range 3.36 – 5.62, SD 0.55). Table 2 lists the top 20 ranked by total priority score.

Table 2: Current PERUKI research priorities (top 20 highest ranking questions)

Rank	Question	Mean Score

1	In paediatric patients with a fever, are any biomarkers helpful in predicting presence or absence of serious bacterial illness?	5.62
2	In children with possible major trauma, which predictor variables identify serious injury requiring direct transport to a major trauma centre?	5.60
3	In children with septic shock does aggressive fluid management, as opposed to judicious fluid management, improve mortality? ''i.e. a response to FEAST study results in a UK population''	5.57
4	In children with acute severe asthma requiring IV therapy is salbutamol, aminophylline, magnesium or a combination of these superior in safety, and clinical and cost effectiveness?	5.53
5=	In paediatric major trauma patients with major haemorrhage does IV tranexamic acid compared to no treatment reduce mortality and morbidity?	5.50
5=	In children with c-spine injury, does currently available guidance provide satisfactory performance accuracy in identifying significant injuries?	5.50
7	In children with atraumatic limp (or possible orthopaedic sepsis) what is the best clinical decision rule for observation/investigation/management?	5.34
8	In children with petechiae, can a clinical decision rule be derived to determine which predictor variables necessitate investigation?	5.33
9	Are observation wards/clinical decisions units within EDs cost-effective?	5.28
10	In children with head injury, does the updated NICE guidance compared with other clinical decision rules provide an acceptable management strategy in terms of performance accuracy and economic considerations?	5.26
11=	What are current procedural sedation practices within EDs in the UK & Ireland?	5.24
11=	In children with massive haemorrhage, does treatment with tranexamic acid compared with no tranexamic acid increase the rate of thromboembolic events?	5.24
13=	What are the top 10 most commonly occurring patient safety issues occurring in PERUKI EDs?	5.22
13=	In children with sepsis, does the use of paediatric sepsis bundles compared with standard treatment improve clinical outcomes?	5.22
15	What are current practices for pain control for children within EDs in the UK & Ireland?	5.19
16	Has the introduction of paediatric trauma networks and major trauma centres altered the patterns of major injury which affect mortality?	5.17
17=	In children with petechiae, what is a safe minimum period of observation to ensure no clinical deterioration?	5.16
17=	In paediatric patients presenting to the ED can the use of the Paediatric Observation Priority Score compared with the ManChEWS or PEWS more accurately predict severity of illness and hence the need for admission or discharge from the ED?	5.16
17=	In children presenting with an acute moderate exacerbation of wheeze aged 1-16 years does intensive early treatment in the first hour compared with standard treatment reduce subsequent need for hospital admission?	5.16

| 20 | In children with abdominal trauma, does the model provided by the PECARN network accurately identify which patients do not need abdominal imaging? | 5.12 |

The full list of 60 research priorities is available. [Supplementary File: Appendix 1 – Paediatric Emergency Research in the UK & Ireland (PERUKI): Research Priorities – Full Results]

Respondents were also given the opportunity to provide free text comments about the research questions and the survey. Some PERUKI members remarked that some of the research questions were less applicable to certain geographical regions, or to the patient population of individual EDs.

DISCUSSION

This is the first study to establish the research priorities of PEM clinicians in the UK & Ireland. The top ten research priorities include questions on biomarkers for serious bacterial illness, major trauma, intravenous bronchodilators for asthma, and decision rules for fever with petechiae, head injury and atraumatic limp. The results likely reflect clinical dilemmas, or areas in which evidence is lacking, which PERUKI members face in their day-to-day practice. They are deemed as priority areas by respondents either due to the frequency with which they occur, or due to the severity of disease burden.

The study was performed soon after PERUKI was established for several important reasons, including the observation that it had been key for other research networks, such as PECARN, to perform this type of exercise, so establishing and publicising their research focus within their national setting.[8] It is interesting to note that there are many similarities between the priorities identified by the PERUKI and PECARN networks. For example, respiratory illnesses/asthma, clinical prediction rules for high-stakes/low-likelihood diseases, and treatment of infectious diseases were identified as top ten priorities by both networks.

Setting the research agenda for PEM in the UK and Ireland was also important for PERUKI, to support enthusiastic researchers and assist them in conducting studies rather than them branching out in multiple directions with little co-ordination or not having a long-term strategy, a phenomenon which has the potential to occur following the establishment of any research network or collaborative. From the outset, PERUKI has aimed to give clarity to its projects, and to the specific research questions within themes, such that clinicians and researchers could select appropriate studies that could be supported through its network of EDs. This support could be provided at a number of different stages, as outlined in table 2.

Table 2 – Examples of the support that a research network, such as PERUKI, may provide

1	Developing and refining the research question.
2	Developing and/or reviewing the study protocol.
3	Ensuring that study protocols are practicable and achievable for delivery, with due consideration of both the paediatric population and the ED environment.
4	Assisting with grant applications and providing endorsement for studies.
5	Delivering the research. This may be through the full PERUKI network of 43 member sites, or a subgroup of our EDs, selected according to the needs of the study, the target population, and/or the research interests of the site leads.
6	Assisting with the write-up of papers.
7	Dissemination of the final results.
8	Ensuring that there is translation of high quality evidence into practice change throughout the PERUKI sites and beyond, given the "signal site" function of PERUKI sites in regards to best practice.

As a new network, PERUKI is working to identify its capacity for the number and the complexity of studies that will be feasible. Early work, including surveys and observational studies,[9-12], has

stress-tested the network to a degree and PERUKI has successfully collaborated with other international PEM networks. In the future, each member site is likely to encounter its own resource and capacity issues, and the overall capacity of PERUKI is not yet understood. By focusing on the high-priority research questions identified in this study, the network can ensure that the most important work is addressed before it reaches limits of capacity. In addition, it is hoped that, by sharing and publishing the research priorities of PERUKI, this will lead to collaboration with other networks.

There is considerable enthusiasm for research within the PERUKI network, and a wide range of research questions have been proposed for future studies. Some key themes were evident from the final list of priorities. Unsurprisingly, clinical conditions that present frequently to EDs, such as febrile illness, asthma and major/minor trauma were well represented in the final results list. Several research questions related to a perceived requirement to validate decision rules that are in common practice, such as the CHALICE rule for head CT scans, as contained within the NICE head injury guideline.[13] There was recognition that the creation of decision rules for other presenting complaints, such as atraumatic limp and petechial rash, would assist clinicians and reduce practice variation. There was also an appreciation that there are several themes that require considerable research, but that the first step should be to establish current practices within EDs in the UK and Ireland.

Some of these research questions can be addressed for relatively little funding, generating clinically important results, and the prospect of early translation to practice and improvement in clinical care. In contrast, other studies will require a long-term approach and access to competitively sought funding streams.

Workstreams have been established for clinical topics in which several research questions have been prioritised, so that future research projects are conducted with an underlying strategy in a logical

and coordinated manner. Within these workstreams, knowledge gaps can be filled by research using various study types including evidence synthesis, reviews, retrospective and prospective observational work and, ultimately, interventional work. Current PERUKI workstreams include the Childhood Acute Asthma Research Program (CAARP),[9, 10], a working group appraising and developing pre-hospital paediatric trauma triage tools,[11, 12], and a further workstream establishing best practice in paediatric procedural sedation throughout the UK and Ireland.

A major strength of the prioritisation exercise was that the PERUKI members who responded to the surveys represent a variety of health practitioner roles and department types and sizes. PERUKI membership is non-restrictive, and any individual with enthusiasm for PEM research is entitled to join the network, regardless of their previous level of research experience. They therefore form a select, but representative, sample of the full range of PEM practitioners within the UK & Ireland. The chosen methodology allowed an initial phase of unrestricted idea formation, before a second phase of review and scoring using a Likert scale.

There were some limitations to the study. The survey was restricted to its own members who, by definition, have a self-declared interest in research. This subgroup of practitioners might be subject to bias, because of their own research agenda, and it is possible that a process that was open to all PEM clinicians within the UK and Ireland might have generated different results. Furthermore, additional weight would have been conferred to the prioritisation results if other stakeholders, particularly parents/carers, had been consulted at some point in the study.

The 51% response rate to the stage 1 survey was less than had been hoped for, although this response is generally accepted as adequate. The majority of the study was conducted using an online platform, rather than face-to-face. However, this method allowed for the generation of a large number of questions from a broad range of professional types across the geographical areas which PERUKI incorporates. Finally, the refinement of the questions was conducted by a small group

of individuals, who are subject to potential bias. It is also possible that this group might have missed subtle nuances of some of the stage 1 questions. However, efforts were taken to ensure that, where clarity was required, further detail was obtained from the person who submitted the question.

By distributing and sharing the results of this prioritisation exercise, it is hoped that they will spark interest and encourage any clinician to develop a research proposal and utilise the PERUKI infrastructure to develop a collaborative study. Trainees have been included in this information sharing, in order to help inform, focus and motivate them to become involved in PEM research from a relatively early stage in their careers. When applying for research funding, the presence of a research question on the prioritisation list can be used to add weight to the submission, as such questions clearly demonstrate importance to clinicians working in PEM.

The results are also being shared directly with funding bodies, many of whom are actively seeking studies that are identified as priorities within a specific clinical field, particularly when clinicians and researchers within the field have identified their enthusiasm for participating in those studies designed to answer these research questions.

CONCLUSION

The research priorities of PEM clinicians in the UK & Ireland have been identified. These results serve as a catalyst for future collaboration in the development of the studies of greatest impact for PEM in our setting. As the identified research questions encompass several themes, and are underpinned by varying levels of existing evidence, they require allocation to separate distinct workstreams and funding programs. It is acknowledged that these results have been developed by just one stakeholder group and, therefore, should not be viewed as the sole research agenda for PEM, with no consideration for alternative topics or research questions. Nevertheless, it is the hope that by sharing this prioritisation exercise with clinicians, academics and funding bodies, there will be a

tangible benefit in the quantity and quality of multi-centre PEM research in the UK & Ireland, with a clear focus on studies that will bring about significant improvement in the emergency care of children.

CONTRIBUTORSHIP STATEMENT

SH designed the study, developed the surveys, participated in the stage 1B shortlisting process, collated and analysed the data, drafted the article and approved the final version. ROS, IKM, CB, and FC participated in the stage 1B shortlisting process, appraised and assisted in drafting the article, and approved the final version. MDL assisted with the study design and survey development, participated in the stage 1B shortlisting process, appraised and assisted in drafting the article, and approved the final version.

COMPETING INTERESTS

There are no competing interests.

SUPPLEMENTARY FILE

Appendix 1

Paediatric Emergency Research in the UK & Ireland (PERUKI): Research Priorities – Full Results

REFERENCES

1) Shilling V, Williamson P, Hickey H, Sowden E, Smyth R. Processes in recruitment to randomised controlled trials of medicines for children (RECRUIT): a qualitative study. *Health Technology Assessment* 2011;15(15):116.

2) Modi N, Vohra J, Preston J, *et al.* Guidance on clinical research involving infants, children and young people: an update for researchers and research. *Arch Dis Child* Published Online First: 9 June 2014 doi:10.1136/archdischild-2014-306444

3) Klassen TP, Acworth J, Bialy L, *et al.* Pediatric Emergency Research Networks: a global initiative in pediatric emergency medicine. *Pediatr Emerg Care* 2010;26:541–3.

4) Lyttle MD, O'Sullivan R, Hartshorn S, *et al.* Pediatric Emergency Research in the UK and Ireland (PERUKI): developing a collaborative for multicentre research. *Arch Dis Child* 2014;99:602-603

5) Modi N, Clark H, Wolfe I, *et al.* A healthy nation: strengthening child health research in the UK. *Lancet* 2013;381:73-87

6) Rudolph S, Hiscock H, Price A, *et al.* What research questions matter to Australian paediatricians? National Delphi study. *J Paediatr Child Health* 2009;45:704-710

7) Hasson F, Keeney S, McKenna H. Research guidelines for the Delphi survey technique. *J Adv Nurs* 2000;32:1008-1015

8) Miller SZ, Rincon H, Kuppermann N, *et al.* Revisiting the emergency medicine services for children research agenda: priorities for multicenter research in pediatric emergency care. *Acad Emerg Med* 2008;15:377–383

9) Lyttle MD, O'Sullivan R, Doull I, *et al.* Variation in treatment of acute childhood wheeze in emergency departments of the United Kingdom and Ireland: an international survey of clinician practice. *Arch Dis Child* Published Online First: 25 August 2014 doi:10.1136/archdischild-2014-306591

10) Morris I, Lyttle M, Doull I, *et.al.* What intravenous bronchodilators are being administered to children presenting with acute severe wheeze in the UK and Ireland? *Thorax* Published Online First: 10 October 2014 doi:10.1136/thoraxjnl-2014-206041

11) Cheung R, Ardolino A, Lawrence T, *et al.* The accuracy of existing prehospital triage tools for injured children in England - an analysis using trauma registry data. *Emerg Med J* 2013;30:476–479

12) Ardolino A, Cheung CR, Lawrence T, *et al.* The accuracy of existing prehospital triage tools for injured children in England: an analysis using emergency department data. *Emerg Med J* 2014 Published Online First: 8 April 2014 doi:10.1136/emermed-2013-203251

13) National Institute for Health and Care Excellence (2014). Head injury: triage, assessment, investigation and early management of head injury in children, young people and adults [CG176]. London: National Institute for Health and Care Excellence.