The Royal College of Emergency Medicine

Clinical Audits

# Vital Signs in Children Clinical Audit 2015-16

## National Report

Published: 31 May 2016

# Contents

## Foreword

***Dr Clifford Mann, President***

***Dr Taj Hassan, President Elect***

Paediatric attendances account for 25% of Emergency Department attendances. Of those, the patients attending for medical reasons e.g. fever/ unwell take up a disproportionate amount of senior clinician time.

Paediatric Emergency Medicine is particularly challenging because we know there will be a few very sick children amongst the many children with similar symptoms who have a self-limiting illness – the needles in the haystack.

In the paediatric population we know that standardised assessment and scoring methods can help clinicians spot the sick children but no tool is currently sufficiently sensitive or specific.

From the data in this audit we know that one third of the children presenting to the ED are infants – those below 2 years old who have limited ability to communicate symptoms and are therefore the most challenging.

This audit confirms that there is much good practice in Emergency Departments but highlights disparate assessment methods for these patients. The RCEM Audit committee and Quality in Emergency Care committee will liaise with other expert bodies such as the Royal College of Paediatrics and Child Health to promote greater standardisation.

Applying good principles and assessment tools will ensure that we minimise the likelihood of missing serious illness in this challenging group of patients.

Co-signed:
*Dr Adrian Boyle, Chair of Quality in Emergency Care Committee*
*Dr Jeff Keep, Chair of Standards & Audit Subcommittee*

## Executive summary

A total of 16231 children presenting to 191 Emergency Departments (EDs) were included in this audit.

The following spider graph is a summary of the national performance against the audit standards.

This was the first time this audit has been conducted on a paediatric population, having previously been run on an adult population in 2010.

Vital signs are important to record in children presenting at EDs because, if abnormal, they indicate that a patient has deranged physiology. This derangement is often indicative of a disease process and associated with an increased risk of morbidity and mortality[1]. The detection of abnormal vital signs, appropriate escalation and response can avoid patient deterioration and improve patient outcomes.

The purpose of the audit is to monitor documented care against the standards, and is as such formative, not summative. The audit is designed to drive clinical practice forward by helping clinicians examine the work they do day-to-day and benchmark against their peers but also recognise excellence. There is much good practice occurring and we believe that this audit is an important component in sharing this and ensuring patient safety.

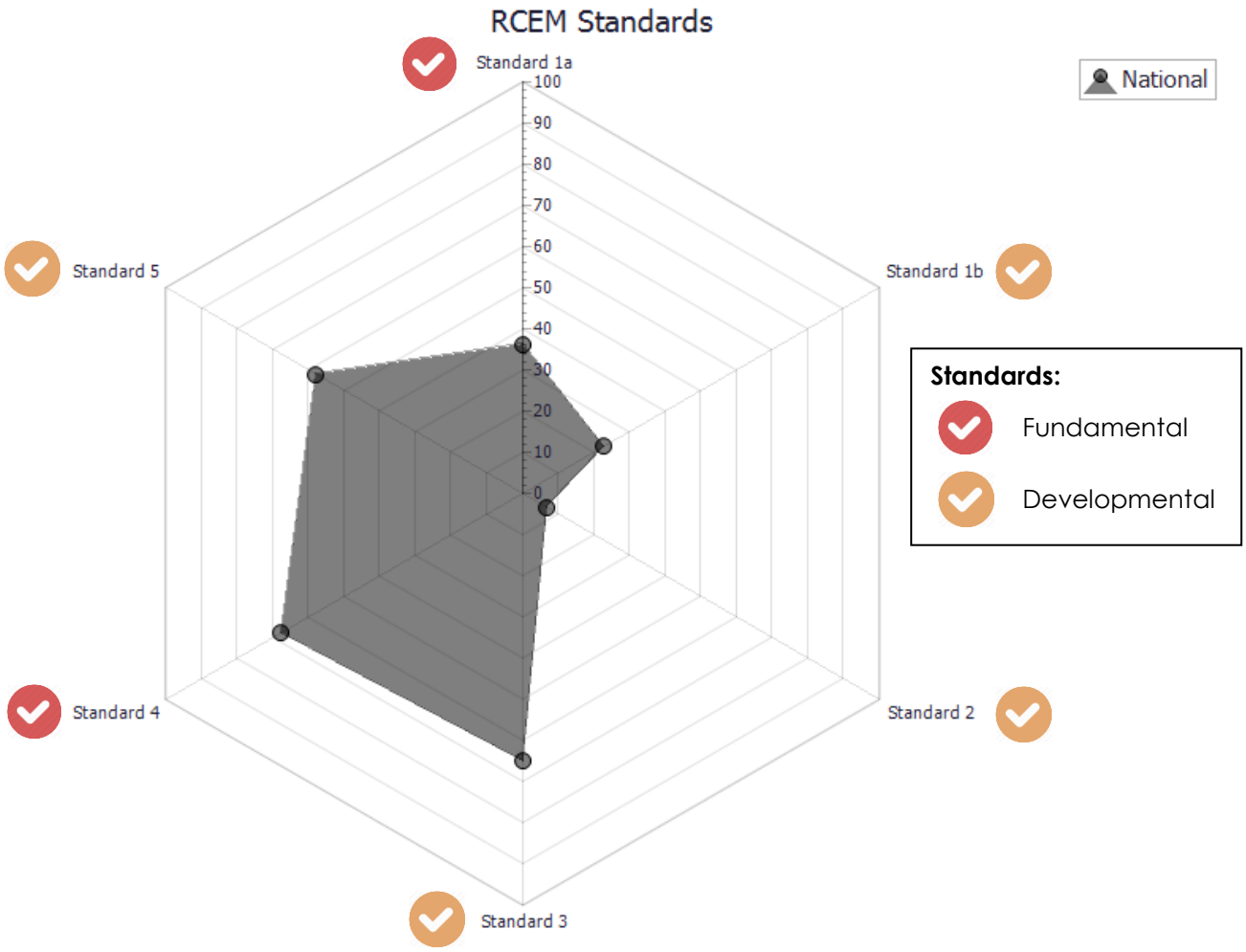
The results of this audit show that there is a need for increased documentation of both initial and repeat vital signs within the timeframes stated in the standards, which is within 15 minutes of arrival or triage and 60 minutes for the repeat.

Whilst there is room for improvements, documentation regarding the recognition and acting to address the abnormal signs is generally good.

Where possible, it is important that children with persistently abnormal vital signs are reviewed by a senior doctor before being discharged home.

# Vital Signs Clinical Audit 2015-16

**This graph shows the mean national performance on all standards for this audit.**




**Standard 1** - All children attending the ED with a medical illness should have a set of vital signs consisting of **(1a)** temperature, respiratory rate, heart rate, oxygen saturation, GCS or AVPU score, and **(1b)** capillary refill time recorded in the notes within 15 minutes of arrival or triage, whichever is the earliest.

**Standard 2** - Children with any recorded abnormal vital signs should have a further complete set of vital signs recorded in the notes within 60 minutes of the first set.

**Standard 3** - There should be explicit evidence in the ED record that the clinician recognised the abnormal vital signs (if present).

**Standard 4** – There should be documented evidence that the abnormal vital signs (if present) were acted upon in all cases.

**Standard 5** – Children with any recorded persistently abnormal vital signs who are subsequently discharged home should have documented evidence of review by a senior doctor (ST4 or above in emergency medicine or paediatrics, or equivalent non-training grade doctor).

↑ **Higher scores (e.g. 100%)** indicate higher compliance with the standards and better performance.

↓ **Lower scores (e.g. 0%)** indicate that your ED is not meeting the standards and may wish to investigate the reasons.

## Introduction

This report shows the results from an audit of vital signs in children under the age of 16 years with a medical illness (as opposed to an injury) who presented at participating EDs in the UK, the Isle of Man and the Channel Islands.

Sets of vital signs consist of: temperature, respiratory rate, heart rate, oxygen saturation, Glasgow Coma Scale (GCS) or AVPU (alert, response to voice, responsive to pain or unresponsive) score, and capillary refill time. Vital signs are frequently recorded in children presenting at EDs because, if abnormal, they indicate that a patient has deranged physiology. This derangement is often indicative of a disease process and associated with an increased risk of morbidity and mortality[1]. The detection of abnormal vital signs, appropriate escalation and response can avoid the patients' deterioration and improve patient outcomes.

The report compares the national returns and the clinical standards published by the Royal College of Emergency Medicine (RCEM) Quality in Emergency Care Committee (QECC). The standards were developed in consultation with the Royal College of Paediatrics and Child Health.

**Nationally, 16231 cases from 191 EDs were included in the audit.**

| Country | Number of relevant EDs | Number of cases |
|---|---|---|
| National total | 191/233 (82%) | 16231 |
| England | 166/182 (91%) | 13766 |
| Scotland | 9/26 (35%) | 1090 |
| Wales | 10/13 (77%) | 925 |
| Northern Ireland | 4/9 (44%) | 350 |
| Isle of Man /Channel Islands | 2/3 (66%) | 100 |

Note: not all EDs see children.

**RCEM Standards**

The audit asked questions against standards published by RCEM in June 2015:

| Standard | Standard type |
|---|---|
| 1. All children attending the ED with a medical illness should have a set of vital signs consisting of<br>(a) temperature, respiratory rate, heart rate, oxygen saturation, GCS or AVPU score, and<br>(b) capillary refill time<br>recorded in the notes within 15 minutes of arrival or triage, whichever is the earliest. | **(a) Fundamental**<br>(b) Developmental |
| 2. Children with any recorded abnormal vital signs should have a further complete set of vital signs recorded in the notes within 60 minutes of the first set. | Developmental |
| 3. There should be explicit evidence in the ED record that the clinician recognised the abnormal vital signs (if present). | Developmental |
| 4. There should be documented evidence that the abnormal vital signs (if present) were acted upon in all cases. | **Fundamental** |
| 5. Children with any recorded persistently abnormal vital signs who are subsequently discharged home should have documented evidence of review by a senior doctor (ST4 or above in emergency medicine or paediatrics, or equivalent non-training grade doctor). | Developmental |

**Understanding the different types of standards**

**Fundamental:** need to be applied by all those who work and serve in the healthcare system. Behaviour at all levels and service provision need to be in accordance with at least these fundamental standards. No provider should provide any service that does not comply with these fundamental standards, in relation to which there should be zero tolerance of breaches.

**Developmental**: set requirements over and above the fundamental standards.

**Aspirational**: setting longer term goals.

For definitions on the standards, refer to appendix.

**Audit history**

All EDs in the UK, Republic of Ireland, Isle of Man and the Channel Islands were invited to participate in June 2015. Data were collected using an online data collection tool. This is the first time this audit has been conducted. The audit is included in the NHS England Quality Accounts for 2015/2016.

Participants were asked to collect data from ED/patient records on consecutive cases of children (under 16 years old) who presented to the ED with a medical illness, including rashes and abdominal pain, between 1st January 2015 and 31st December 2015.

**Sample size**

RCEM recommended auditing a different number of cases depending on the number of the patients seen within the data collection period. If this was an area of concern, EDs were able to submit data for more cases for an in depth look at their performance.

| Expected number of cases | Recommended audit sample |
|---|---|
| < 50 | All eligible cases |
| 50-250 | 50 consecutive cases |
| >250 | 100 consecutive cases |

**Format of this report**

The table overleaf shows the overall results of all participating trusts. The table indicates the variations in performance between departments as displayed through the lower and upper quartiles of performance as well as the median values. More detailed information about the distribution of audit results can be obtained from the charts on subsequent pages of the report. Please bear in mind the comparatively small sample sizes when interpreting the charts and results.

**Feedback**

We would like to know your views about this report, and participating in this audit. Please let us know what you think by completing our feedback survey:
www.surveymonkey.co.uk/r/RCEMaudit15

We will use your comments to help us improve our future audits and reports.

## Summary of national findings

| | RCEM Standard | National Results (16231 cases) | | |
|---|---|---|---|---|
| | | Lower quartile | Median* | Upper quartile |
| **Initial vital signs** | | | | |
| Formal vital signs scoring system used | | 19% | 64% | 93% |
| **STANDARD 1a:** All children attending the ED with a medical illness should have a set of vital signs consisting of (a) temperature, respiratory rate, heart rate, oxygen saturation, GCS or AVPU score recorded in the notes within 15 minutes of arrival or triage, whichever is the earliest. | 100% | 25% | 37% | 52% |
| **STANDARD 1b:** All children attending the ED with a medical illness should have a set of vital signs consisting of (a) temperature, respiratory rate, heart rate, oxygen saturation, GCS or AVPU score, **and (b) capillary refill time** recorded in the notes within 15 minutes of arrival or triage, whichever is the earliest. | 100% | 7% | 20% | 37% |
| Patients with recorded abnormal vital signs | | 35% | 44% | 52% |
| **STANDARD 3:** Explicit evidence in the ED record that the clinician recognised the abnormal vital signs. | 100% | 52% | 71% | 86% |
| **STANDARD 4:** Documented evidence that the abnormal vital signs (if present) were acted upon in all cases. | 100% | 55% | 74% | 89% |
| **Repeated vital signs** | | | | |
| **STANDARD 2:** Children with any recorded abnormal vital signs have a further complete set of vital signs recorded in the notes within 60 minutes of the first set (including CRT). | 100% | 0% | 4% | 11% |
| Children with any recorded abnormal vital signs have a further complete set of vital signs recorded in the notes within 60 minutes of the first set (excluding CRT). | | 3% | 9% | 18% |
| Repeated vital signs abnormal | | 48% | 58% | 69% |
| **Discharged patients** | | | | |
| Child discharged home | | 57% | 68% | 80% |
| *…of which had normal vital signs* | | 26% | 42% | 58% |
| **STANDARD 5:** Children with any recorded persistently abnormal vital signs who are subsequently discharged home have documented evidence of review by a senior doctor (ST4 or above in emergency medicine or paediatrics, or equivalent non-training grade doctor). | 100% | 33% | 60% | 100% |

**Notes about the results**

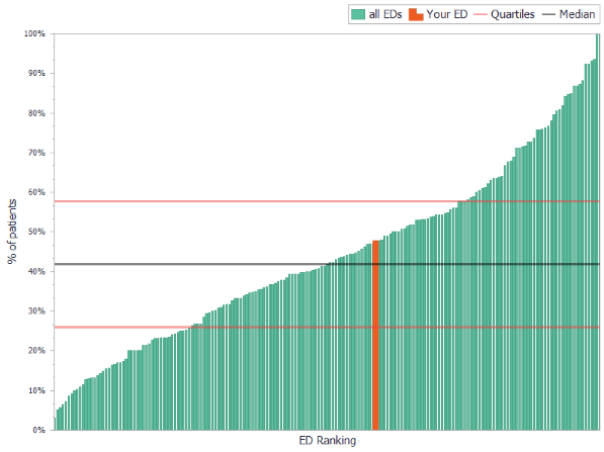
*The median value of each indicator is that where equal numbers of participating EDs had results above and below that value.

These median figures may differ from other results quoted in the body of this report which are mean (average) values calculated over all audited cases.

The lower quartile is the median of the lower half of the data values.
The upper quartile is the median of the upper half of the data values.

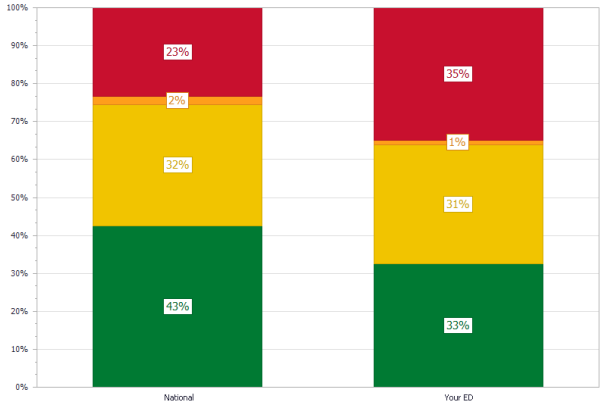
## Understanding the charts

### Sorted Bar Chart



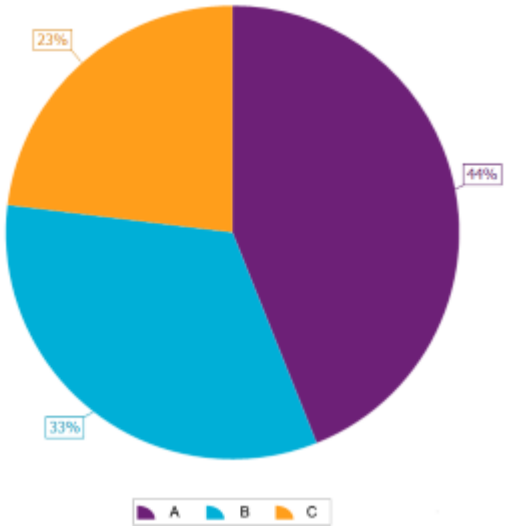

Sorted bar charts show the national performance, where each bar represents the performance of an individual ED. The horizontal lines represent the median and upper/lower quartiles.

### Stacked Bar Chart




Stacked bar charts show the breakdown of a group nationally. These are used when it will be helpful to compare two groups side by side, for example comparing local data with the national data.

### Pie Chart

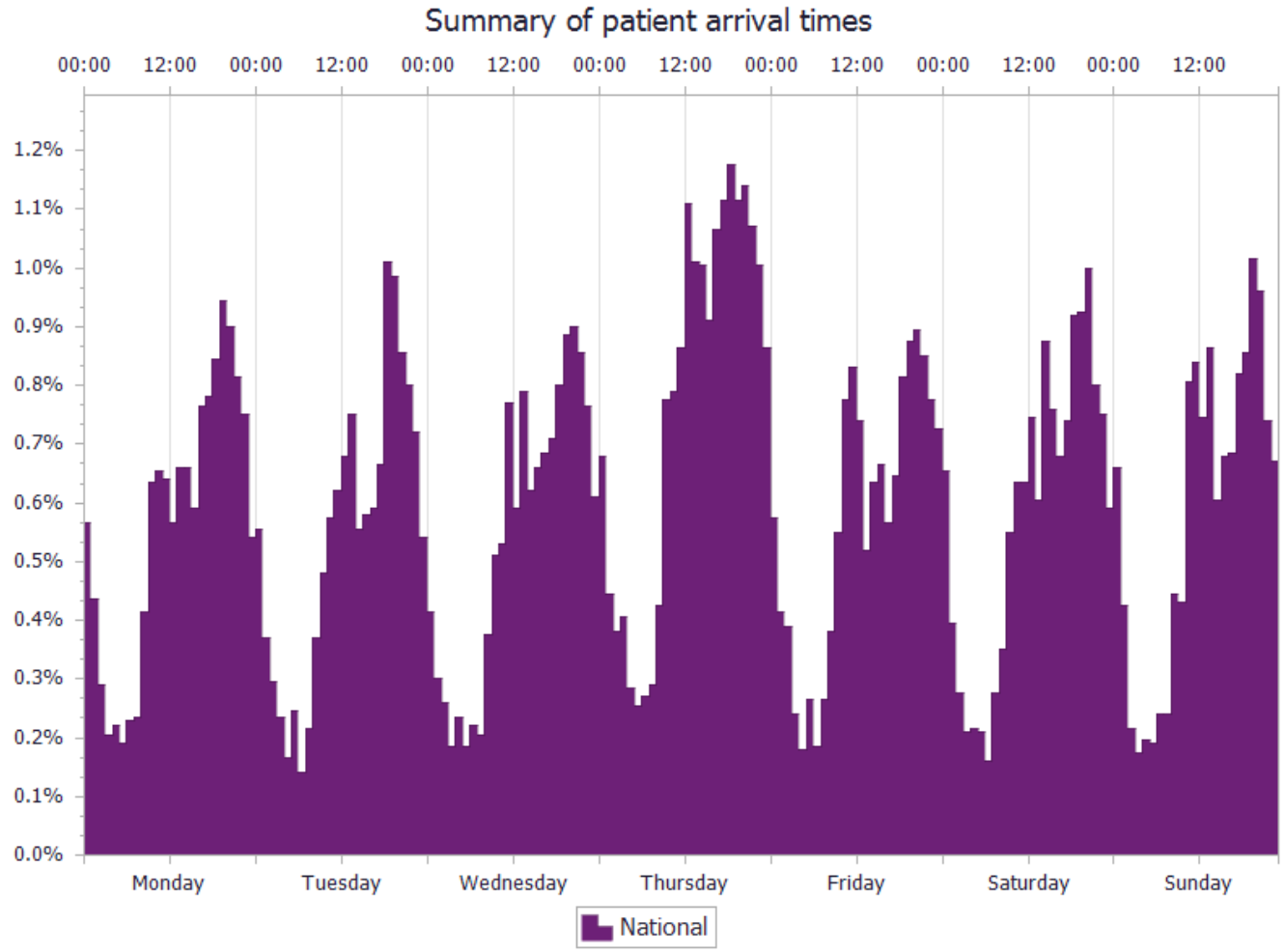



Pie charts show the breakdown of a group nationally.

## SECTION 1: Casemix

National casemix and demographics of patients.

**Q1 and Q2. Date and time of arrival**



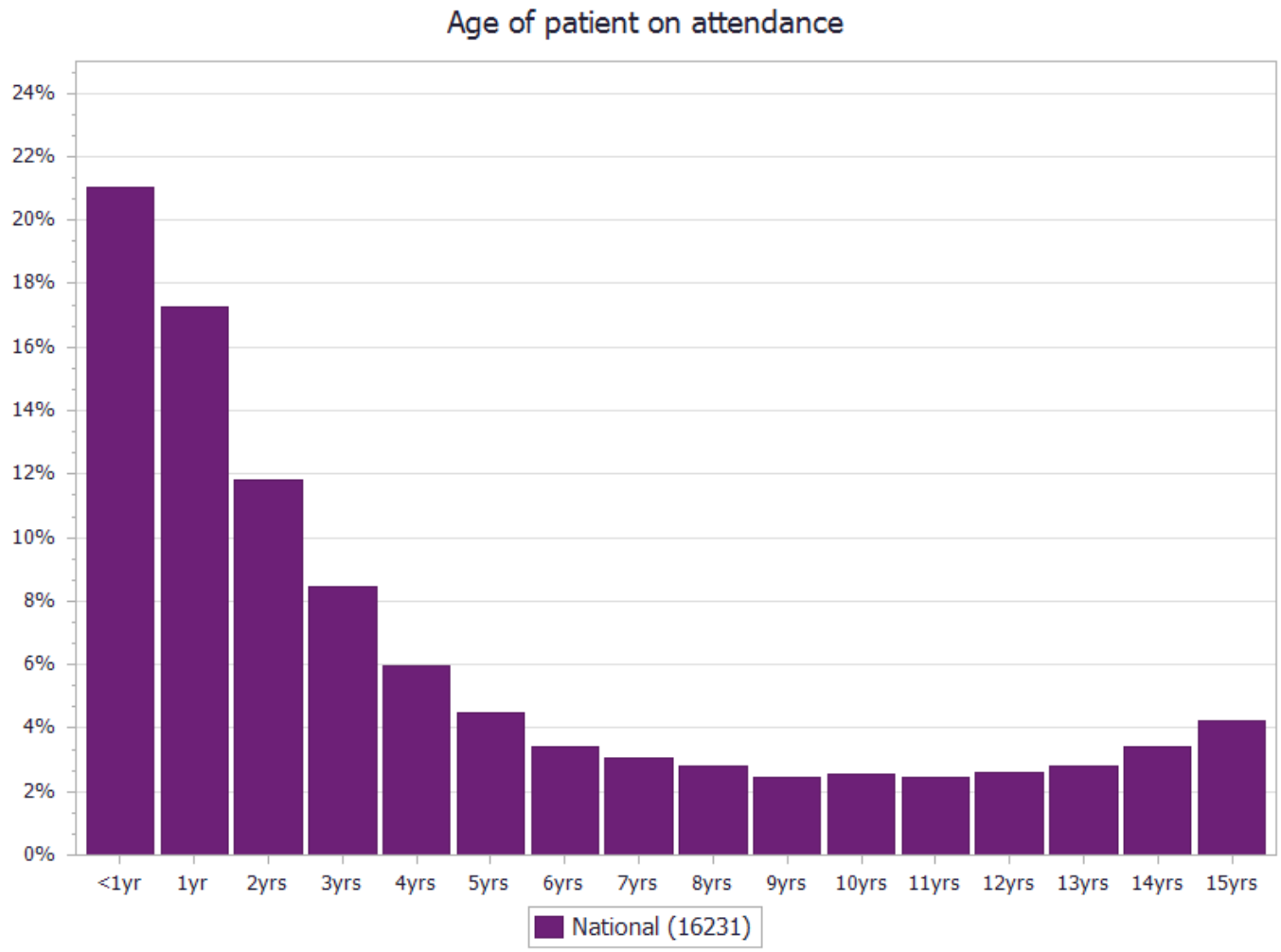

*Sample: all patients*

This graph demonstrates the presentation of children throughout the week.

The attendance pattern is broadly regular through the week and weekend, with a slight spike on Thursday evenings. This may be due to parents not being able to secure Friday GP appointments ahead of the weekend and therefore present at the ED on a Thursday, however the audit did not collect such data.

Patient arrival rate varies throughout the day and night, with 19.6% arriving between 00:01-08:59.

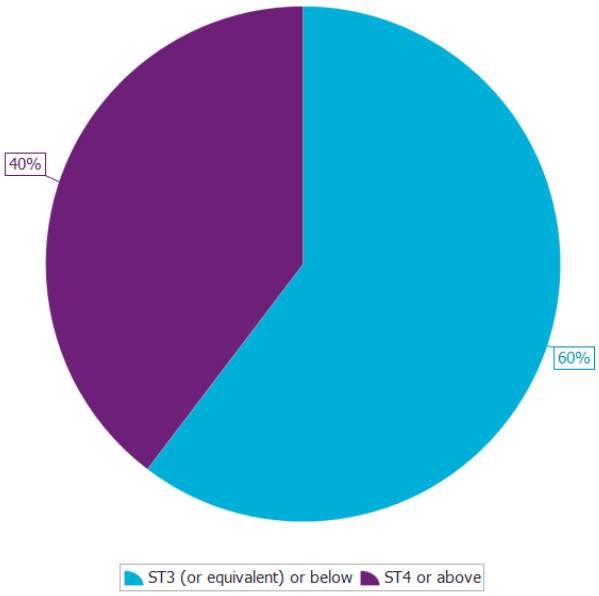
**Q3 Patient age**




*Sample: all patients*

This shows that more than a third of paediatric patients presenting with a medical illness are infants (below 2 years) and therefore the most challenging group to assess.

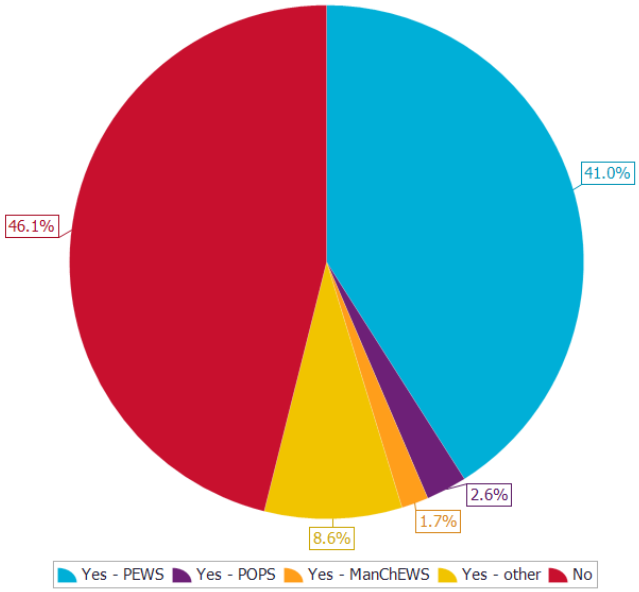
**Q2b Grade of doctor first assessing the patient**




*Sample: all patients*

Nearly half of these patients are first assessed by a more experienced emergency doctor, which is a welcome statistic.

**Q5 Were the vital signs recorded as part of a formalised scoring system?**




*Sample: all patients*

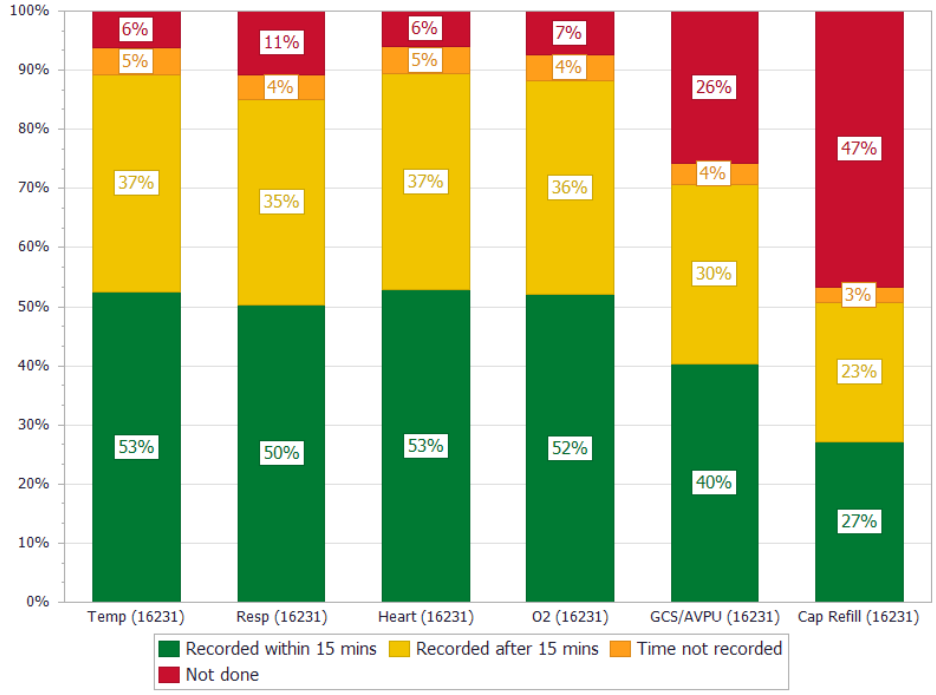
There is clearly a heterogeneous range of scoring systems being used, and this is an opportunity for improvement.

To enable sick children to be identified, there is a clear need to agree a standardised scoring method that all clinicians can use.

RCEM recommends PEWS (or an equivalent early warning score), as this will minimise the risk of miscommunication.

## SECTION 2: Audit results

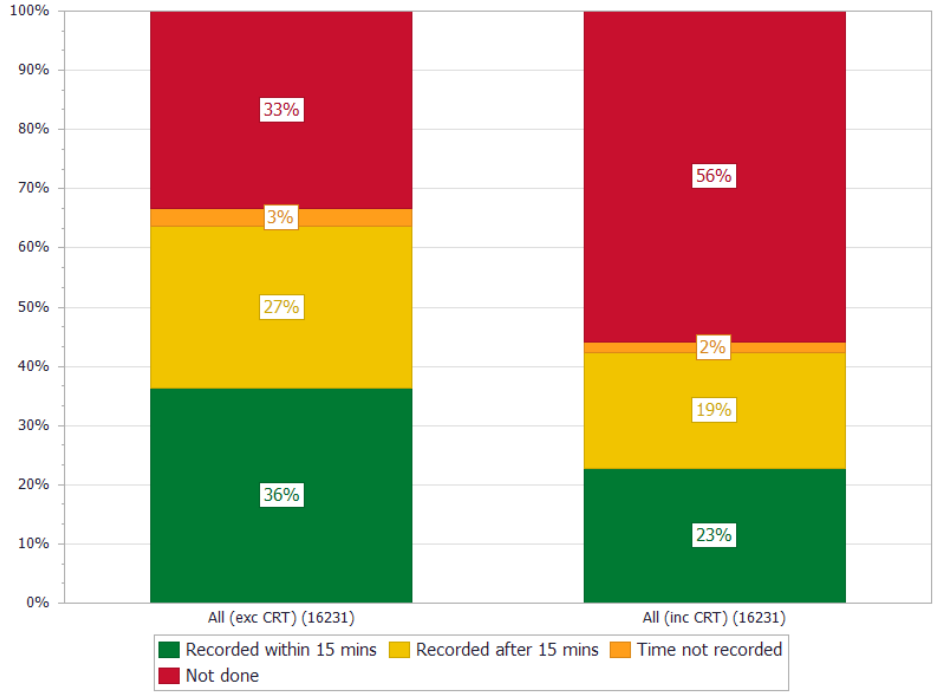
### Q4 Were the following vital signs recorded in the ED notes?




*Sample: all patients*

While the proportion of children being assessed within 15 minutes could be better, it is gratifying to see that the vast majority are having their vital signs taken and recorded in the notes.

### Q4 Were <u>all</u> the vital signs recorded in the ED notes?




**STANDARD 1:** All children attending the ED with a medical illness should have a set of vital signs consisting of

(a) temperature, respiratory rate, heart rate, oxygen saturation, GCS or AVPU score, and

(b) capillary refill time recorded in the notes within 15 minutes of arrival or triage, whichever is the earliest.

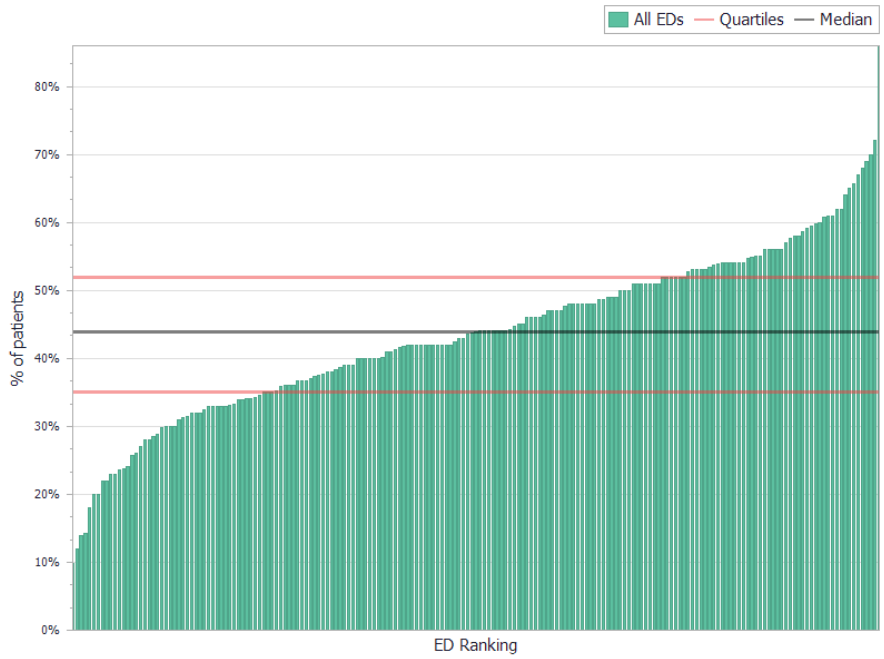
*Sample: all patients*

The median time taken to assess vital signs was 12 minutes.

## Abnormal vital signs

This section gives details about children with abnormal vital signs. You will learn about the national performance of clinicians recognising and acting on abnormal vital signs.

### Q6 Were any of the recorded vital signs abnormal?



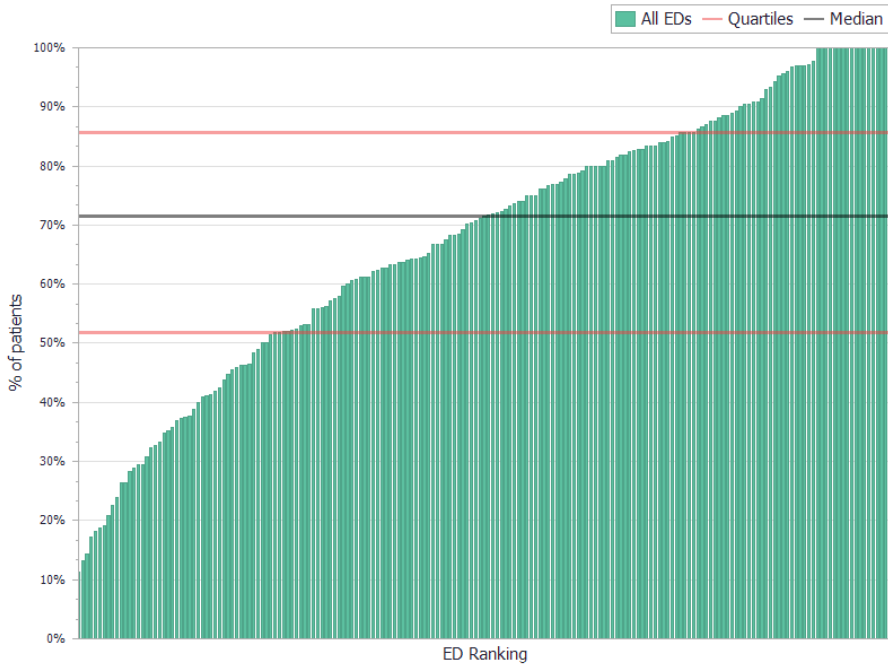

*Sample: all patients*

With nearly half the children having one or more abnormal vital sign, this illustrates the importance of senior clinician assessment.

Senior clinicians are more likely to have the experience to correctly judge the soft signs – the behavioural changes that are seen in pre-verbal children.

Decision-making in paediatric care often requires expert triangulation between vital signs, behaviour and laboratory results.

### Q7 Is there specific evidence in the ED record that the clinician recognised the abnormal vital signs?




**STANDARD 3:** There should be explicit evidence in the ED record that the clinician recognised the abnormal vital signs (if present).

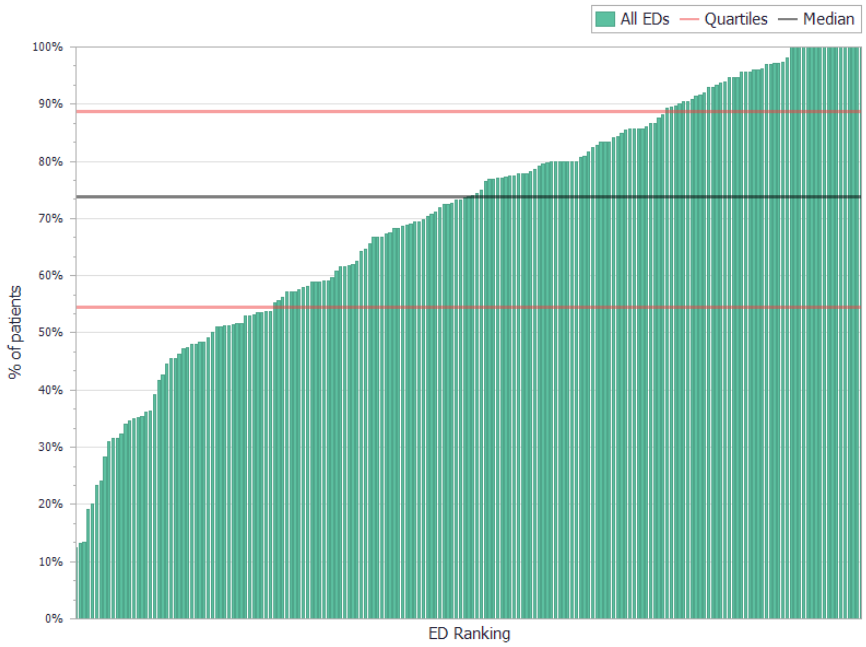
*Subsample: Q6=yes (n=7073)*

It is important for clinicians to document the patient observations and, where possible, record care plans.

As described in the previous question, clinician response is based on a combination of vital signs, behavioural cues and clinician expertise.

A standardised assessment chart might be able to better capture some of this expert practice.

## Q8 Is there evidence in the ED record that the abnormal vital signs were acted on?




**STANDARD 4:** There should be documented evidence that the abnormal vital signs (if present) were acted upon in all cases.

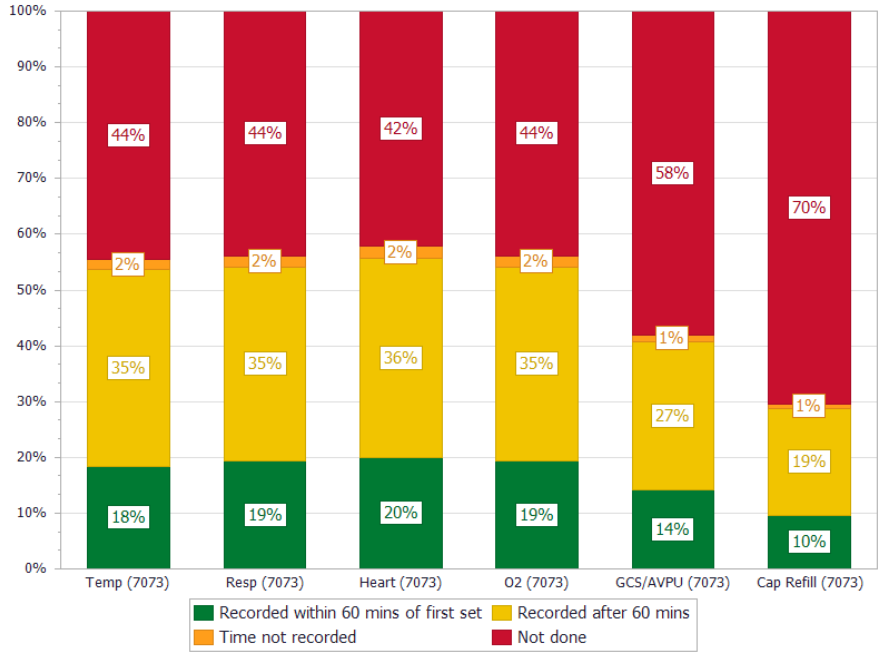
*Subsample: Q6=yes (n=7073)*

This appears a good result with approximately 75% of patients having action taken. However, lower performing EDs are strongly recommended to investigate and address the reasons.

As there are not large numbers of children coming to harm in EDs it would be helpful to understand what the reasons for the 25% are.

A possible explanation for the 25% of recognised vital signs that were not acted on may be false positives, e.g. heart rate taken whilst the patient is distressed.

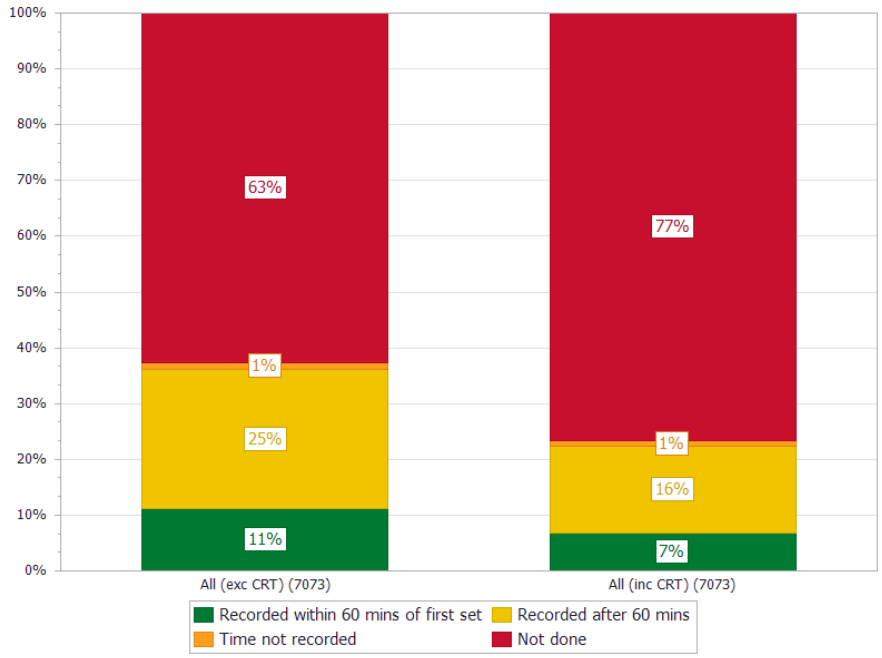
## Q9 Was a repeat set of vital signs recorded in the ED notes?




*Subsample: Q6=yes (n=7073)*

Although rarely achieved within 60 minutes, repeat sets of vital signs were often taken and documented. Capillary refill is not often performed and this may be because clinical staff find it unhelpful, insensitive or difficult to interpret consistently in this population group.

## Q9 Were <u>all</u> the repeat vital signs recorded in the ED notes?

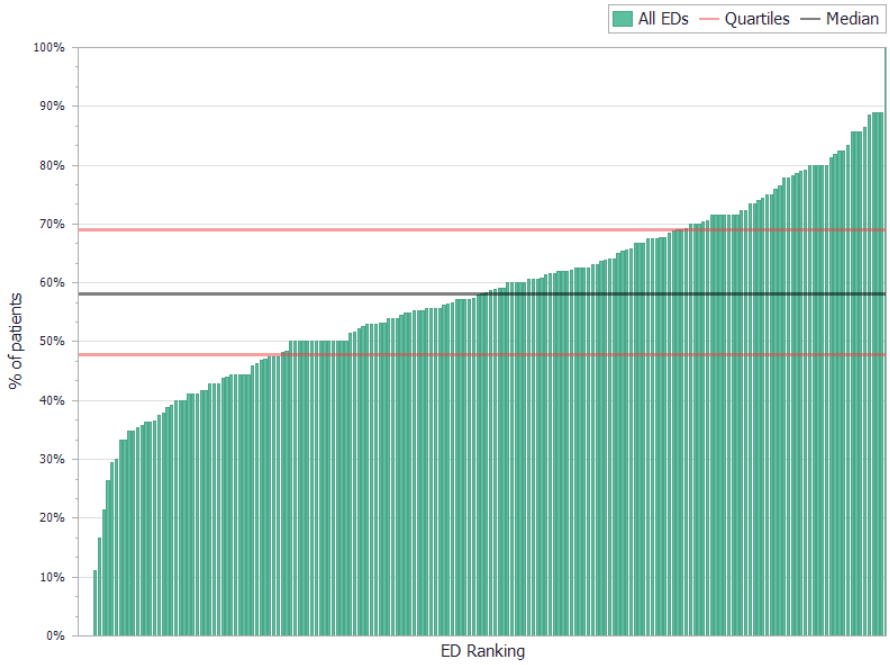



**STANDARD 2:** Children with any recorded abnormal vital signs should have a further complete set of vital signs recorded in the notes within 60 minutes of the first set.

*Subsample: Q6=yes (n=7073)*

Of the 7073 children with abnormal initial observations, 7% had a repeat set of observations recorded within 60 minutes.

## Q10 Were any of the repeated vital signs abnormal?




*Subsample: Q6=yes AND Q9a=yes (n=4397)*

This graph shows us the proportion of children with abnormal vital signs on both the initial and repeated recording.

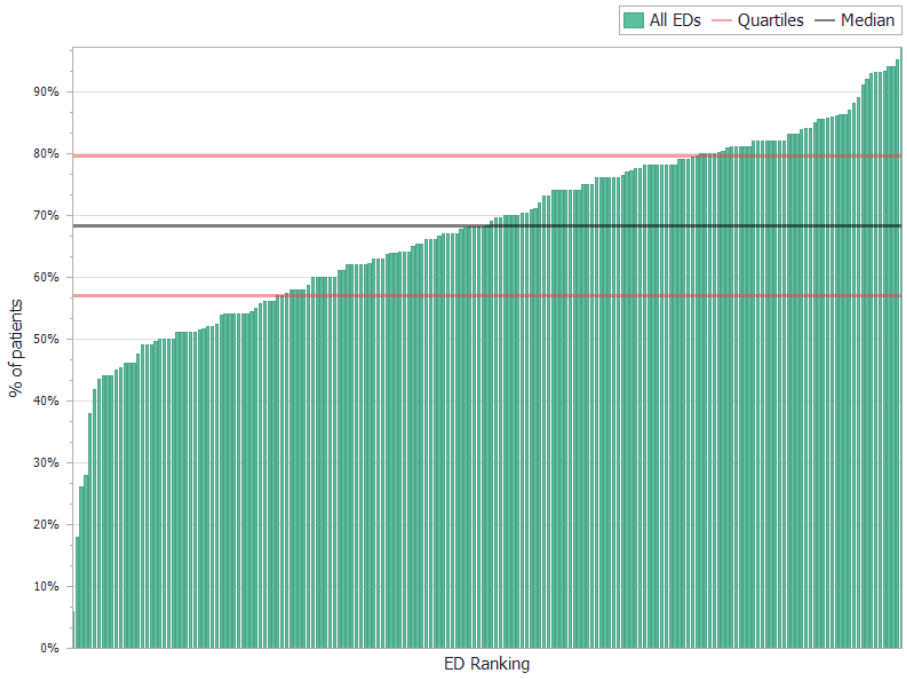
This shows that half of the patients with abnormal vital signs remain abnormal.

The proportion of patients with repeated abnormal vital signs recorded varies widely between departments, which is likely to indicate poor recording practice.

## Discharge

This section tells you more about performance related to the patient's discharge from the ED.

### Q11 Was the patient discharged home?

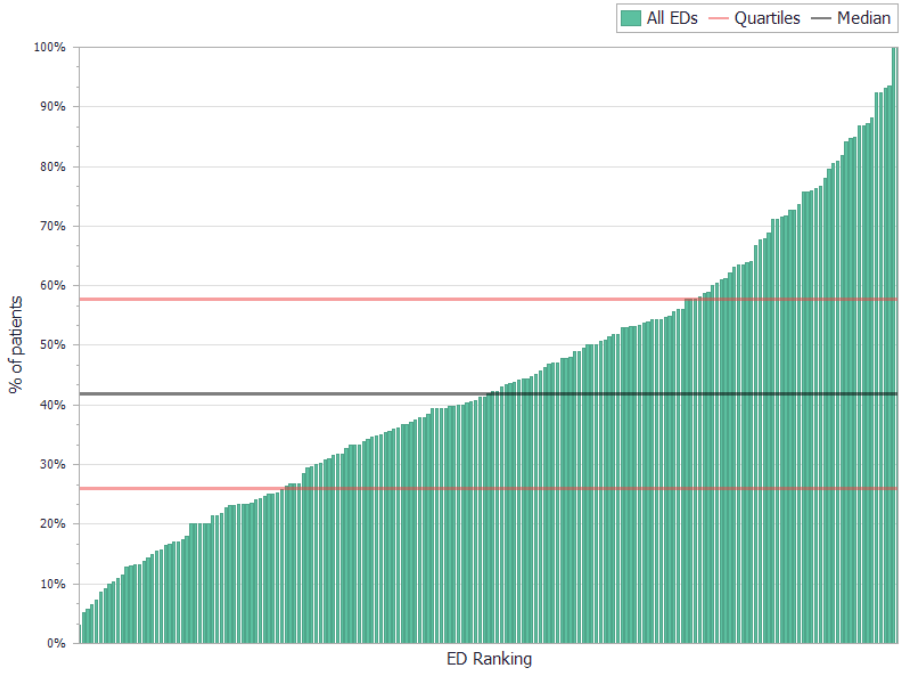



*Sample: all patients*

The majority of children presenting to EDs with medical illnesses are discharged home. However, there is a large spread, indicating a wide variety in clinical practice.

This may be the result of the use of paediatric observation units or local arrangements with commissioners, e.g. that paediatric patients are routinely 'admitted for assessment'.

### Q11a Where the patient was discharged home, were their vital signs normal?

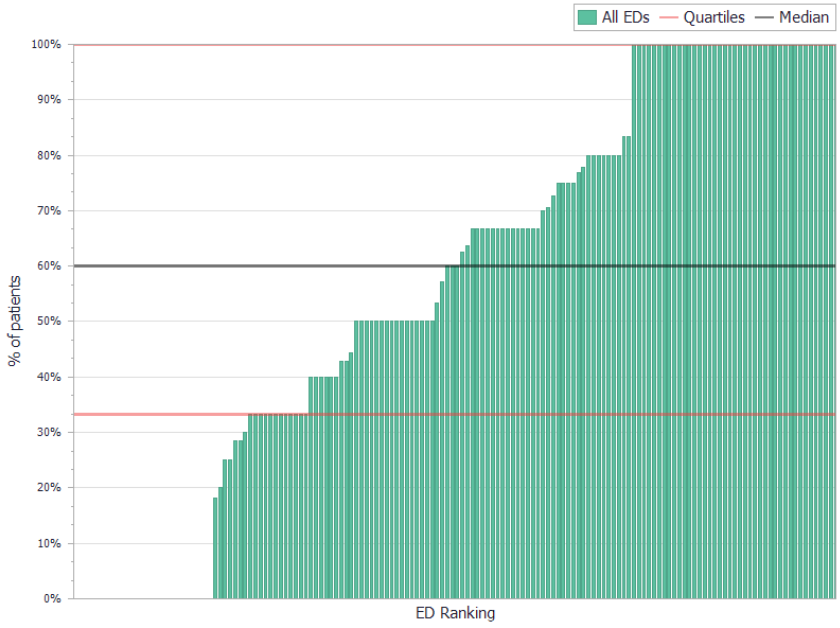



*Subsample: Q11=yes (n=11041)*

The green bars show the proportion of children discharged home with normal vital signs. Therefore, the EDs with lower proportion are either discharging children with abnormal vital signs or not recording vital signs prior to discharge.

As it appears that only 42% of children achieve normal vital signs before discharge, this graph is more likely to indicate missing data rather than abnormal signs.

**Q12 Is there documented evidence of a review by a senior doctor at discharge - for children with persistently abnormal vital signs?**



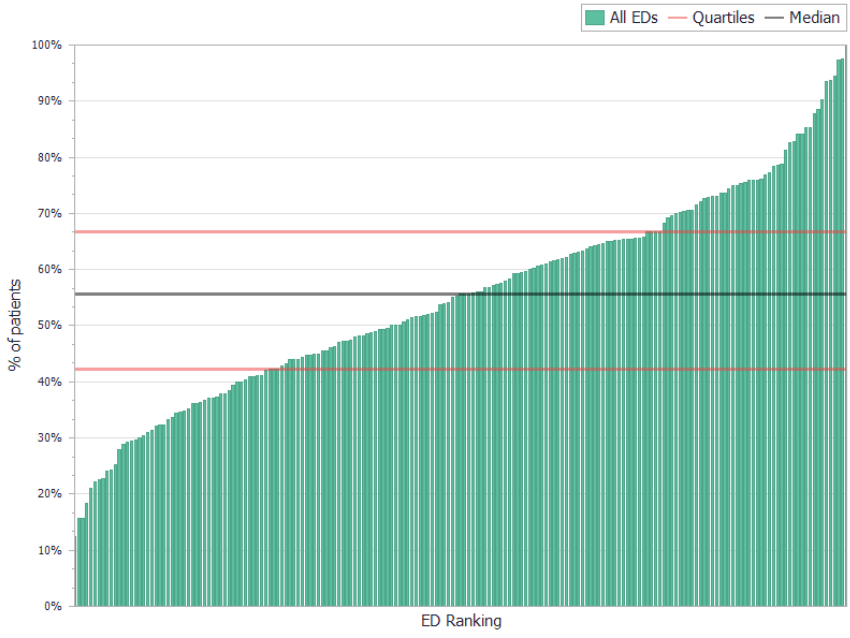

**STANDARD 5:** Children with any recorded persistently abnormal vital signs who are subsequently discharged home should have documented evidence of review by a senior doctor (ST4 or above in emergency medicine or paediatrics, or equivalent non-training grade doctor).

*Subsample: Q11=yes and Q6, 10 & 11a=abnormal vital signs*

This standard measures the proportion of patients reviewed by a senior doctor before discharge, including only those with recorded persistently abnormal vital signs. 'Persistently' is defined in this audit as being abnormal at all 3 of the following points:

- First vital signs recording
- Repeat vital signs recording
- Discharge vital signs recording

**Q12 Is there documented evidence of a review by a senior doctor at discharge?**

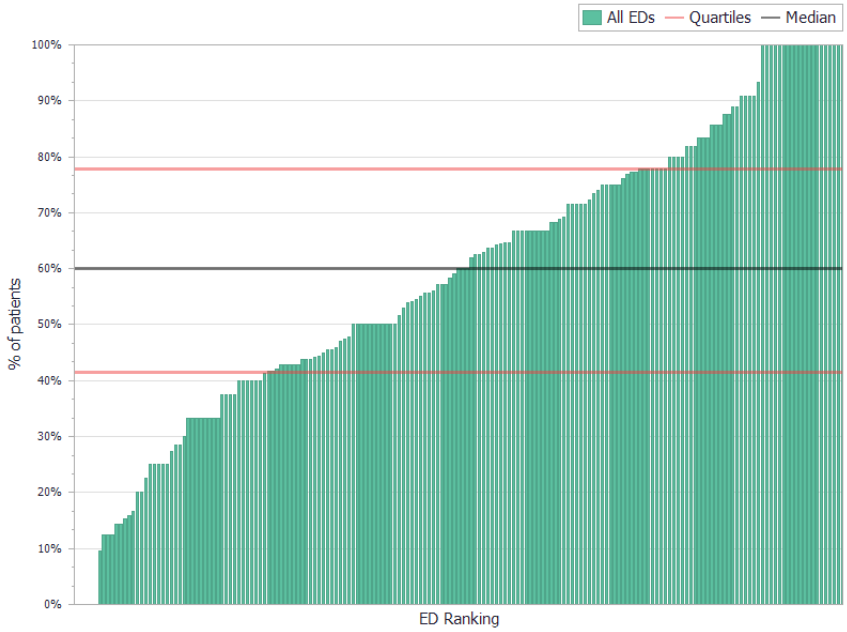



As a comparison to Standard 5, this shows the proportion of all patients reviewed by a senior doctor at discharge, regardless of vital signs.

At less than 56% this result was low, bearing in mind the 20% proportion of children below the age of 1 year that were identified in Q3.

Children under one year old with fever are a clear high-risk group with a quality standard of senior review.

**Is there documented evidence of a review by a senior doctor - for children under one year of age?**




*Sample: Q3=below 1 (n=3413)*

RCEM advocates that children under one year of age are reviewed before discharge by a consultant, senior doctor (ST4 or above), or staff grade or similar substantive career grade doctor with sufficient ED experience to be designated to undertake this role by the EM consultant medical staff.

The consultant review should be recorded in the patient's clinical notes, and should normally include the patient being seen and reviewed in person by the EM consultant. If the consultant is unable to make a contemporaneous note in the patient's ED record they should countersign the notes at the next opportunity, making a record of the date and time that this occurred.

## Analysis

There is much good practice demonstrated in this audit, with high numbers of patients being assessed by more experienced ED staff.

Strong multidisciplinary working in the ED team is important for timely and effective monitoring of vital signs in children, particularly the vital role of nursing staff who are often responsible for the assessment of vital signs.

There is a need to limit multiple disparate vital signs scoring systems and for expert opinion to agree a paediatric assessment score. RCEM recommends using PEWS (or an equivalent early warning score) for national adoption. This should not prevent development of quality improvements but these should occur in the context of a properly implemented action plan.

### Limitations

A limitation is that this audit included only patients presenting with medical illnesses. EDs may wish to conduct a local audit including other paediatric patients.

### Research recommendations

Future research efforts may wish to look at a wider section of the paediatric urgent and emergency care e.g. Walk in Centres, GP out of hours and check whether these standards should inform a uniform paediatric assessment process. Equally it may be that the populations of children that access these services are very different, with a much lower risk of serious disease.

## Summary of recommendations

1. ED clinicians should ensure that children presenting with medical illnesses have a full set of vital signs taken and documented within 15 minutes of arrival or triage.

2. ED clinicians should ensure that children with abnormal vital signs should have a further complete set taken and documented within 60 minutes.

3. ED clinicians should ensure adequate documentation of patients' care plans for those with abnormal vital signs, ensuring consistent validation and escalation of abnormal results.

4. ED clinicians should consider with management how to maximise consistency of assessment. RCEM recommends that all EDs adopt a vital signs scoring system, such as PEWS (or an equivalent early warning score).

5. ED clinicians should ensure that a reliable process is in place for senior review of paediatric patients with any recorded persistently abnormal vital signs who are subsequently discharged home.

### Using the results of this audit to improve care

The results of this audit should be shared with staff who have responsibility for looking after children with medical illnesses. Discussing the results of this audit with colleagues is a good way of demonstrating the ED's commitment to improving care. Engaging staff in the action planning process will lead to more effective implementation of the plan.

EDs may wish to consider using a rapid cycle audit methodology, which can be used to track performance against standards, as a tool to implement the action plan. For further resources, please visit the RCEM Quality Improvement webpage.

**Further Information**

Thank you for taking part in this audit. We hope that you find the results helpful.

If you have any queries about the report please e-mail audit@rcem.ac.uk or phone 020 7400 6108.

Feedback is welcome at: www.surveymonkey.co.uk/r/RCEMaudit15

Details of the RCEM Clinical Audit Programme can be found under the Current Audits section of the RCEM website.

**Useful Resources**

- Site-specific report – available to download to the clinical audit website
- Site-specific PowerPoint presentation – developed to help you disseminate your site-specific audit results easily and efficiently
- Data file – a spreadsheet that allows you to conduct additional local analysis using your site-specific data for this audit. This year you can also access data from other EDs to customise your peer analysis.
- King, D; Morton, R; Bevan, C (Nov 13, 2013). "How to use capillary refill time". *Archives of disease in childhood. Education and practice edition* 2014;**99**:111-116. www:10.1136/archdischild-2013-305198.
- RCEM Consultant Sign-Off standard: www.rcem.ac.uk/Shop-Floor/Clinical%20Standards/Consultant%20sign%20off

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## Pilot sites

We are grateful to contacts from the following trusts for helping with the development of the audit:

Airedale General Hospital
Barnsley Hospital
Birmingham Children's Hospital
City Hospital, Birmingham
Forth Valley Royal Hospital
Huddersfield Royal Infirmary
Leicester Royal Infirmary
Northampton General Hospital
Queen Elizabeth Hospital (The), King's Lynn
Royal Berkshire Hospital
Royal Blackburn Hospital
Royal Gwent Hospital
Royal United Hospital, Bath
Sheffield Children's Hospital
Stoke Mandeville Hospital
University Hospital of Wales
Wishaw General Hospital
Worthing Hospital
Wythenshawe Hospital

**References**

[1] Armstrong BP, Clancy M, Simpson H. Making sense of vital signs. EMJ 2008;25:790-1

[2] Samuels M and Wieteska S (2011). Advanced Paediatric Life Support: The practical approach (5th ed.). Manchester: Advanced Life Support Group.

[3] NICE Clinical Guideline: Feverish illness in children (CG160) (May 2013)

## Appendix 1: Audit questions

The Royal College of Emergency Medicine

Clinical Audits

*EXCELLENCE IN EMERGENCY MEDICINE*

### Vital Signs in Children
### 2015/2016

**Casemix**

| | | | | | |
|---|---|---|---|---|---|
| Q1 | Date of arrival *(dd/mm/yyyy)* | dd/mm/yyyy | | | |
| Q2 | Time of arrival or triage – whichever is earliest *(use 24 hour clock e.g. 11.23pm = 23:23)* | HH:MM | | | |
| Q2a | Time patient first assessed by doctor | HH:MM | | | |
| Q2b | Grade of doctor first assessing patient | ST3 or below | | | |
| | | ST4 or above | | | |
| Q3 | Age of patient on attendance | Below 1 | | 8 | |
| | | 1 | | 9 | |
| | | 2 | | 10 | |
| | | 3 | | 11 | |
| | | 4 | | 12 | |
| | | 5 | | 13 | |
| | | 6 | | 14 | |
| | | 7 | | 15 | |

**First vital sign recording**

| | | | | | |
|---|---|---|---|---|---|
| Q4 | Were the following vital signs recorded in the ED notes? | | | | |
| Q4a | Temperature | Yes | | No | |
| | | Time | HH:MM | Time not recorded | |
| Q4b | Respiratory rate | Yes | | No | |
| | | Time | HH:MM | Time not recorded | |
| Q4c | Heart rate | Yes | | No | |
| | | Time | HH:MM | Time not recorded | |
| Q4d | Oxygen saturation | Yes | | No | |
| | | Time | HH:MM | Time not recorded | |

| | | | | | |
|---|---|---|---|---|---|
| Q4e | GCS or AVPU score | Yes | | No | |
| | | Time | HH:MM | Time not recorded | |
| Q4f | Capillary refill time | Yes | | No | |
| | | Time | HH:MM | Time not recorded | |

| | | | |
|---|---|---|---|
| Q5a | Were the vital signs recorded as a part of a formalised scoring system (e.g. PEWS, POPS or ManChEWS? | Yes | |
| | | No → *(go to Q6)* | |
| Q5b | (Only answer if YES to Q5a) What formal scoring system was used? | Paediatric early warning score (PEWS) | |
| | | Paediatric observation and priority score (POPS) | |
| | | Royal Manchester Children's Hospital early warning score (ManChEWS) | |
| | | Other (please specify) | |

**Abnormal vital signs**

| | | | |
|---|---|---|---|
| Q6 | Were any of the recorded vital signs abnormal (as defined in the audit standards)? | Yes | |
| | | No → *(go to Q9)* | |
| Q7 | (Only answer if YES to Q6) Is there specific evidence in the ED record that the clinician recognised the abnormal vital signs? | Yes | |
| | | No | |
| Q8 | (Only answer if YES to Q6) Is there evidence in the ED record that the abnormal vital signs were acted upon? | Yes | |
| | | No | |

**Repeat vital sign recording**

| | | | | | |
|---|---|---|---|---|---|
| Q9a | Was a repeat set of vital signs recorded in the ED record? | Yes | | | |
| | | No → *(go to Q11)* | | | |
| b | (Only answer if YES to Q9a) Temperature | Yes | | No | |
| | | Time | HH:MM | Time not recorded | |
| c | (Only answer if YES to Q9a) Respiratory rate | Yes | | No | |
| | | Time | HH:MM | Time not recorded | |
| d | (Only answer if YES to Q9a) Heart rate | Yes | | No | |
| | | Time | HH:MM | Time not recorded | |
| e | (Only answer if YES to Q9a) Oxygen saturation | Yes | | No | |
| | | Time | HH:MM | Time not recorded | |
| f | (Only answer if YES to Q9a) GCS or AVPU score | Yes | | No | |
| | | Time | HH:MM | Time not recorded | |

| | | | | | |
|---|---|---|---|---|---|
| g | (Only answer if YES to Q9a) Capillary refill time | Yes | | No | |
| | | Time | HH:MM | Time not recorded | |
| Q10 | (Only answer if YES to Q9a) Were any of the recorded repeat vital signs abnormal (as defined in the audit standards)? | Yes | | | |
| | | No | | | |

**Discharge**

| | | | |
|---|---|---|---|
| Q11 | Was the patient discharged home? | Yes | |
| | | No → *END* | |
| Q11a | (Only answer if YES to Q11) When the patient was discharged home, were their vital signs normal? | Yes | |
| | | No | |
| | | Not recorded | |
| Q12 | (Only answer if YES to Q11) Is there documented evidence of review by a senior doctor (ST4 or above in emergency medicine or paediatrics, or equivalent non-training doctor)? | Yes | |
| | | No | |

| Notes |
|---|
| |

## Appendix 2: Participating Emergency Departments

Aberdeen Royal Infirmary
Addenbrooke's Hospital
Airedale General Hospital
Alder Hey Hospital
Alexandra Hospital
Antrim Area Hospital
Arrowe Park Hospital
Barnet Hospital
Barnsley Hospital
Basildon University Hospital
Basingstoke North Hampshire Hospital
Bedford Hospital
Birmingham Children's Hospital
Blackpool Victoria Hospital
Bradford Royal Infirmary
Bristol Royal Infirmary
Bronglais General Hospital
Broomfield Hospital
Calderdale Royal Hospital
Causeway Hospital
Chelsea and Westminster Hospital
Chesterfield Royal Hospital
Chorley and South Ribble Hospital
City Hospital
Colchester General Hospital
Conquest Hospital
Countess of Chester Hospital
County Hospital
Croydon University Hospital
Cumberland Infirmary (The)
Darent Valley Hospital
Darlington Memorial Hospital
Derriford Hospital
Diana, Princess of Wales Hospital
Dorset County Hospital
Dr Gray's Hospital
Ealing Hospital
East Surrey Hospital
Eastbourne District General Hospital
Epsom General Hospital
Fairfield General Hospital
Forth Valley Royal Hospital
Frimley Park Hospital
Furness General Hospital
George Eliot Hospital
Glan Clwyd Hospital
Glangwili General Hospital
Glasgow Royal Infirmary
Gloucestershire Royal Hospital
Good Hope Hospital
Grantham and District Hospital
Great Western Hospital (The)
Hairmyres Hospital
Harrogate District Hospital
Heartlands Hospital
Hereford County Hospital
Hillingdon Hospital
Hinchingbrooke Hospital
Homerton University Hospital
Horton Hospital
Huddersfield Royal Infirmary
Hull Royal Infirmary
Ipswich Hospital
James Cook University Hospital (The)
James Paget Hospital
John Radcliffe Hospital
Kettering General Hospital
King's College Hospital
Kings Mill Hospital
Kingston Hospital
Leeds General Infirmary
Leicester Royal Infirmary
Leighton Hospital
Lincoln County Hospital
Lister Hospital
Luton & Dunstable University Hospital
Macclesfield District General Hospital
Maidstone District General Hospital
Manor Hospital
Medway Maritime Hospital
Milton Keynes Hospital
Monklands Hospital
Morriston Hospital
Musgrove Park Hospital
Nevill Hall Hospital
New Cross Hospital
Newham General Hospital
Noble's Hospital
Norfolk and Norwich University Hospital
North Devon District Hospital
North Manchester General Hospital
North Middlesex Hospital
Northampton General Hospital
Northumbria Specialist Emergency Care Hospital
Northwick Park Hospital
Ormskirk and District General Hospital
Peterborough City Hospital
Pilgrim Hospital
Pinderfields Hospital
Poole General Hospital

Princess Alexandra Hospital
Princess Elizabeth Hospital (The)
Princess of Wales Hospital
Princess Royal Hospital
Princess Royal University Hospital
Queen Alexandra Hospital
Queen Elizabeth Hospital (The), King's Lynn
Queen Elizabeth Hospital, Gateshead
Queen Elizabeth Hospital, Woolwich
Queen Elizabeth The Queen Mother Hospital
Queen's Hospital, Burton-on-Trent
Queen's Hospital, Romford
Queen's Medical Centre
Rotherham District General Hospital
Royal Albert Edward Infirmary
Royal Alexandra Children's Hospital
Royal Belfast Hospital for Sick Children
Royal Berkshire Hospital
Royal Blackburn Hospital
Royal Bolton Hospital
Royal Bournemouth Hospital
Royal Cornwall Hospital
Royal Derby Hospital
Royal Devon and Exeter Hospital (Wonford)
Royal Free Hospital
Royal Gwent Hospital
Royal Hampshire County Hospital
Royal Lancaster Infirmary
Royal London Hospital (The)
Royal Manchester Children's Hospital
Royal Oldham Hospital
Royal Preston Hospital
Royal Shrewsbury Hospital
Royal Stoke University Hospital
Royal Surrey County Hospital
Royal United Hospital
Royal Victoria Infirmary
Russells Hall Hospital
Salford Royal Hospital
Salisbury District Hospital
Sandwell General Hospital
Scarborough General Hospital
Scunthorpe General Hospital
Sheffield Children's Hospital
Solihull Hospital
South Tyneside District General Hospital
Southampton General Hospital
Southend Hospital
Southmead Hospital
St George's Hospital
St Helier Hospital
St John's Hospital at Howden
St Mary's Hospital, Newport
St Mary's Hospital, Paddington
St Peter's Hospital
St Richard's Hospital
St Thomas' Hospital
Stepping Hill Hospital
Stoke Mandeville Hospital
Sunderland Royal Hospital
Tameside General Hospital
Torbay District General Hospital
Tunbridge Wells Hospital
Ulster Hospital
University College Hospital
University Hospital (Coventry)
University Hospital Lewisham
University Hospital of North Durham
University Hospital of North Tees
University Hospital of Wales
Victoria Hospital
Warrington Hospital
Warwick Hospital
Watford General Hospital
West Cumberland Hospital
West Middlesex University Hospital
West Suffolk Hospital
Weston General Hospital
Wexham Park Hospital
Whipps Cross University Hospital
Whiston Hospital
Whittington Hospital (The)
William Harvey Hospital
Wishaw General Hospital
Withybush Hospital
Worcestershire Royal Hospital
Worthing Hospital
Wrexham Maelor Hospital
Wythenshawe Hospital
Yeovil District Hospital
York Hospital
Ysbyty Gwynedd

## Appendix 3: Standards definitions

The standards can be found under standards on page 7.

**Standard 2**

For the purposes of this audit, abnormal vital signs are defined as:

a) Temperature (degrees Celsius)[3]
   - <35 or >37.9 in children <3 months of age
   - <35 or >38.9 in children 3-6 months of age
   - <35 in children >6 months of age (**NB**: no upper limit)

b) Respiratory rate (breaths per minute)[2]
   - <30 or >40 in children <1y of age
   - <25 or >35 in children aged 1-2 years
   - <25 or >30 in children aged 2-5 years
   - <20 or >25 in children aged 5-12 years
   - <15 or >20 in children aged >12 years

c) Heart rate (beats per minute)[2]
   - >160 in children <12 months
   - >150 in children aged 12-24 months
   - >140 in children aged >2 - 5 years
   - >120 in children aged >5 - 12 years
   - >100 in children aged >12 years

d) Oxygen saturation (%) in air ≤95%[3]

e) GCS <15 or less than 'Alert' on the AVPU scale

f) Capillary refill time > 3 seconds[3]

**Standard 3**

Evidence can include terms such as 'tachycardic', 'tachypnoeic', 'hypoxic' etc.

**Standard 5**

This includes children under one year old with fever.

**Question and answer definitions**

Q7 – recognition of the abnormal vital signs has to refer to documentation of abnormal findings with a plan, or a plan that is in line with abnormal vitals.

Q8 – Evidence of acting on abnormal vital signs. This includes but is not limited to: prescribing antibiotics, antipyretics, fluids, investigations or further observations. Prescribing an inhaler without commenting on respiratory rate in child with asthma is NOT evidence of acting on vital signs.

Q4 – If the notes record an incorrect or impossible time, for example before patient arrival, please enter 'time not recorded'

Q9 – If the notes record an incorrect or impossible time, for example before patient arrival or before the initial set of vital signs, please enter 'time not recorded'

## Appendix 4: Calculations

This section is intended to explain how each standard is calculated, allowing you to repeat the audit locally.

| Standard | Patient sample | Calculations |
|---|---|---|
| 1a | All | Q4a-e = Yes<br>**AND**<br>Q4a-e ≤ 15 minutes after Q2 |
| 1b | All | Q4a-f = Yes<br>**AND**<br>Q4a-f ≤15 minutes after Q2 |
| 2 | Includes cases where:<br>Q6 = yes | Q9b-g = Yes<br>**AND**<br>Q9b-g ≤ 60 minutes after Q4a-f |
| 3 | Includes cases where:<br>Q6 = yes | Q7 = Yes |
| 4 | Includes cases where:<br>Q6 = yes | Q8 = Yes |
| 5 | Includes cases where:<br>Q6 = yes<br>**AND**<br>Q10 = Yes<br>**AND**<br>Q11 = Yes<br>**AND**<br>Q11a = No | Q12 = Yes |