The Royal College of Emergency Medicine

VITAL SIGNS IN ADULTS

NATIONAL QUALITY IMPROVEMENT PROJECT

NATIONAL REPORT 2018/19

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Contents

Executive Summary

Overview

This report contains the findings from the 2018-19 RCEM national quality improvement project (QIP) on vital signs monitoring in adults.

A total of **20,960** patients presenting to **190** Emergency Departments (ED) had their documented care reviewed in this national clinical audit and quality improvement project (QIP). Previously, an audit of vital signs was conducted in 2010/11. This was the first time the topic had been run as an audit with integrated QIP.

The purpose of the audit and QIP was to monitor documented care against the standards published in July 2018, and to facilitate improved care using QIP methodology and weekly data feedback. QIP methodology was promoted to encourage EDs to improve towards more consistent delivery of these standards, helping clinicians examine the work they do day-to-day, benchmark against their peers, and to recognise excellence.

The performance summary charts in the next section are a summary of the weekly performance against the standards between August 2018 – January 2019.

Key findings

The report shares evidence that since the previous audit, there has been significant improvement in the repeat measurement of vital signs and of appropriate actions taken.

It is clear that departments are using newly developed tools and rising to the challenges of crowding and ever increasing attendances by identifying and prioritising patients who have deteriorated.

This was the first year in which RCEM has used a platform capable of tracking improvements using QI methodology. It is therefore perhaps unsurprising to observe little change in national performance during the six-month project. This likely represents a year in which departments have been familiarising themselves with the new methodology platform before concerted efforts to improve. It also represents the difficult nature of effecting change in busy departments and during a period which has seen particular challenges of crowding and poor hospital flow.

This report represents not just another large scale national clinical audit but the delivery of a shared platform providing QI tools and real time data with, which individual departments can use to progress towards achieving the national standards.

Key recommendations

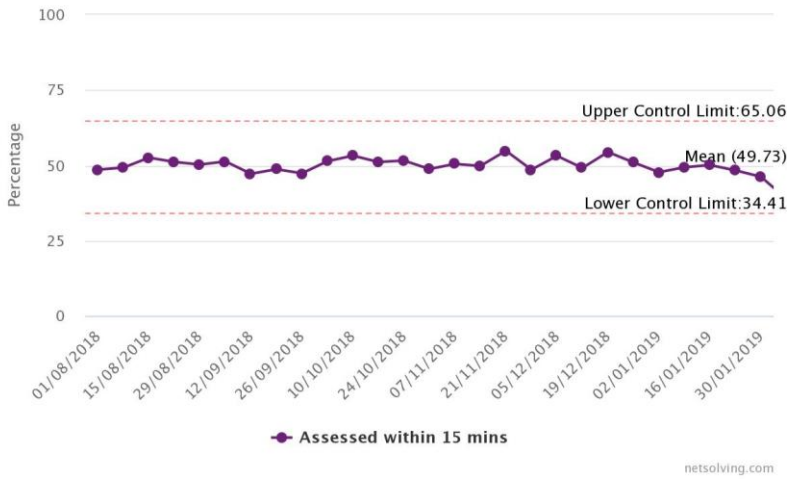
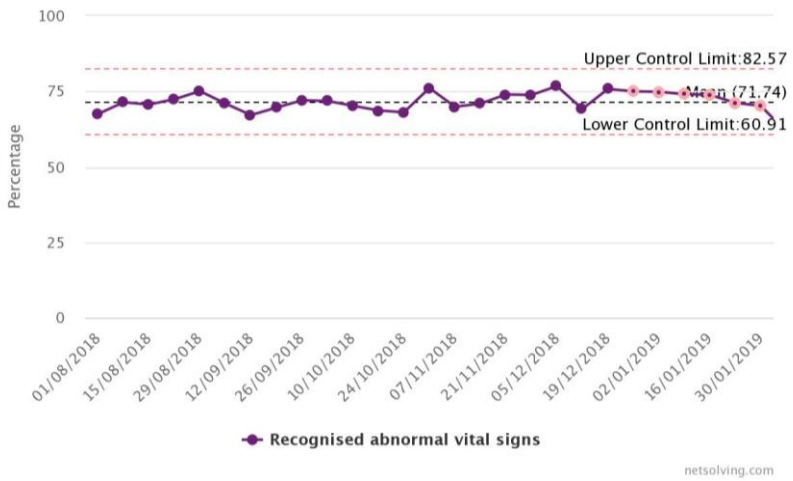
1. Departments struggling to meet the challenge of measuring a complete set of vital signs within 15 minutes of arrival should review their processes and consider how they can learn from higher performing Trusts.

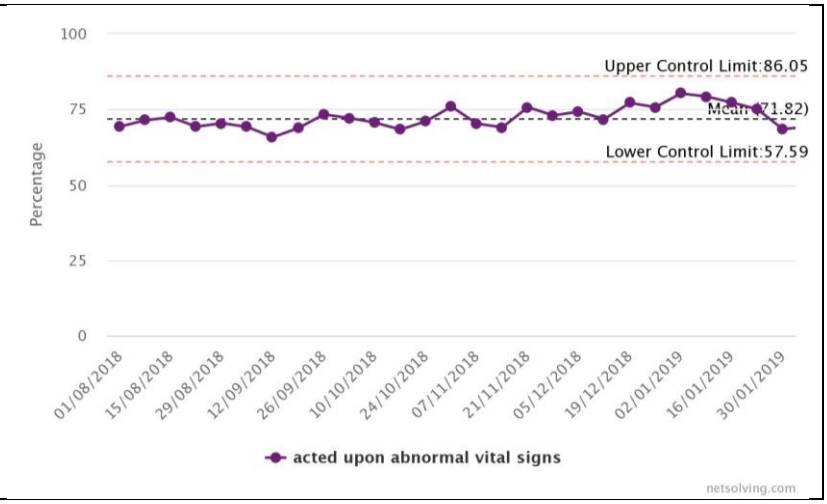
2. Departments are encouraged to use the QI platform to support their QI activities.

3. Departments not achieving repeat vital signs within 60 minutes, should review their results and consider how to effect improvement.

Performance Summary

The below graphs show the weekly performance against standards for this audit. See the appendices for a guide to interpreting these charts.

STANDARD	SPC CHART
STANDARD 1: Patients triaged to the majors or resuscitation areas of the ED should have the following measured and recorded in the notes within 15 minutes of arrival or triage, whichever is the earliest: • respiratory rate • oxygen saturation • pulse • blood pressure • GCS or AVPU score • temperature	
STANDARD 2: Patients with abnormal vital signs, should have their vital signs repeated and recorded in the notes within 60 minutes of the first set of observations.	
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.	

Foreword

Dr Taj Hassan, RCEM President

The commitment of Emergency Departments to engage in quality improvement is a source of great pride to us. We applaud the enthusiasm with which departments have embraced our new style of national clinical audit with integrated QIP methodology. RCEM recognises the pressurised environment most departments continue to work in and is keen to support your fantastic efforts by keeping this QIP open online for you to use locally whenever you want.

We encourage you all to consider how your department can make progress on the three recommendations, particularly if your data shows that this is currently a challenging area for you.

The majority of EDs are now using standardised scoring system to identify acutely ill and deteriorating patients. Such standardised systems used early and regularly have great advantages for patient management. Data collected in this project shows that 84% of patient notes have documented use of a standardised scoring system. Let's get this figure up to 100% so we can all benefit from the advantages of using a standardised system in our departments.

Dr Taj Hassan, RCEM President

Dr Simon Smith, Chair of Quality in Emergency Care Committee

Dr Elizabeth Saunders, Chair of Quality Assurance & Improvement Subcommittee

Introduction

This report presents the results of a national clinical audit and quality improvement project on adult patients (aged 18+) who presented to Emergency Departments (ED) and were triaged to the majors area.

The previous audit (1), conducted in 2010/11 found Pulse (97%), BP (97%), O_2 saturation (96%) and respiratory rate (92%) were well recorded whilst the patient was in the ED. Temperature (88%) and Glasgow Coma Scale (GCS) or Alert, Voice, Pain, Unresponsive (AVPU) (77%) were less well recorded. When patients were alert and talking GCS/AVPU was not routinely recorded in all departments.

The audit of 2010/11 asked whether vital signs were measured within 20 minutes of arrival or triage, rather than the 15 minutes of the current standard. Within this timeframe, the proportion of departments measuring the six vital signs was 52% for GCS/AVPU and 60% - 68% for the other elements. Some EDs were considerably below the mean with 1 in 10 EDs meeting the standard in less than a third of patients for each of pulse, BP, oxygen saturation, respiratory rate and temperature.

GCS (or AVPU) was recorded even less frequently, with 1 in 10 managing it less than 18% of the time. The percentage of audited notes where abnormal vital signs were observed varied greatly between EDs (from 8% to 98%) which suggests considerable variation in patient acuity. The national mean value was 41%.

The standard for repeat measurement of each vital sign within 60 minutes was met for 25% of cases or less with one in 10 EDs achieving 5% or less. Nationally there was documented evidence that of those with abnormal vital signs, 47% had appropriate action taken.

The use of a standardised scoring system was recorded in 84% of patient notes nationally in this project. The most commonly used scoring systems were the National Early Warning Score (NEWS), Early Warning Score (EWS), Modified Early Warning Score (MEWS) and Early Warning Score 2 (NEWS2). NEWS and NEWS2 are the scoring systems used nearly three quarters of the time. Patient tracking systems now often show NEWS to allow easier identification of deteriorating patients.

Background

The Vital Signs standards were originally developed and published in 2010 through a partnership between the Royal College of Emergency Medicine, the Royal College of Nursing, the Faculty of Emergency Nursing and the Emergency Nurse Consultants Association.

The reception of patients and the initial encounter with clinical staff is where the patient journey begins. Clinical priority is determined by the presenting symptoms and vital signs. This is a foundation of clinical quality.

Since the standards were introduced, there has been a growing problem of crowding in EDs with detrimental effects on clinical outcomes. RCEM published a toolkit (2) to assist EDs with managing in a crowded department. The early and repeated measurement of vital signs, and the derived early warning scores, play an increasingly important role in prioritising patients in need of urgent attention and identifying those whose clinical state has deteriorated.

It is this changing picture in Emergency Departments and the results of the previous audit eight years ago that prompted this, the second RCEM audit on vital sign monitoring.

Case study of a patient

Sarah* is a 42 year-old lady. She was recently diagnosed with Addison's disease** and has been coping well with her medications.

Sarah attended the ED at 18:37 following a short illness. She had been vomiting intermittently for 3 days with episodes of diarrhoea. There was a 3 hour wait to be seen by a Doctor.

She was triaged at 18:51. She appeared reasonably well and explained that she thought she had a bug but was worried she might not be keeping her medicines down.

Her observations were:

- Temp 37.3
- Pulse rate 98
- Blood pressure 111/72
- Respiratory rate 18
- Saturations 100% in air
- NEWS2 = 1

The triage nurse discussed with the nurse coordinator and arranged for a space to isolate her due to diarrhoea. She was moved to a side room at 19:12.

At 20:22, the healthcare assistant assigned to the majors area noted Sarah's observations were slightly overdue and repeated them.

- Temp 37.4
- Pulse rate 101
- Blood pressure 107/82
- Resp rate 20
- Sats 100% in air
- NEWS2 = 2

Sarah continued to feel sick and asked for a bowl. She had already filled one. The healthcare assistant asked a doctor if they could prescribe an anti-sickness medication. The doctor prescribed 4mg Ondansetron and intravenous fluids but remained too busy to see Sarah in person.

A serious road traffic collision had occurred at a nearby junction and resulted in the wait to see a Doctor increase further.

The healthcare assistant checked on Sarah at 21:54. She looked unwell. He repeated her observations.

- Temp 38.6
- Pulse 119
- Blood pressure 93/67
- Respiratory rate 22
- Saturations 98%
- NEWS2 = 6

He immediately informed the Nurse Coordinator who asked the registrar to see her urgently. The registrar diagnosed pyelonephritis and Addisonian crisis. He started the sepsis care bundle and Sarah's treatment was all underway by 22:14. The registrar made an urgent referral to the urology team who agreed to take over her care.

Sarah was then commenced on continuous monitoring. Her observations steadily improved. The on-call urologist arrived at 22:42 and found her to be stable with improving vital signs

- Temp 38.2
- Pulse 98
- Blood pressure 102/62
- Respiratory rate 20
- Saturations 100% on 15L
- NEWS = 5

Sarah was transferred to the ward for ongoing care and made a good recovery.

Monitoring of vital signs empowers all members of the team, regardless of experience or seniority to escalate concerns protecting patient from more serious deteriorations.

* Names have been changed.

** People with Addison's disease cannot produce their own steroids. Steroids are a vital hormone and an integral part of the response to stress and illness.

Methodology

Participation summary

Nationally, **20,960** patients presenting to **190** EDs were included in the audit. Click the map below to open an interactive map of participating EDs.

Country	Number of relevant EDs	Number of cases
National total	190/229 (83%)	20,960
England	165/176 (94%)	18,489
Scotland	6/28 (21%)	687
Wales	11/13 (85%)	971
Northern Ireland	6/9 (67%)	618
Isle of Man /Channel Islands	2/3 (67%)	195

Audit methodology and history

All Type 1 EDs in the UK were invited to participate in June 2018. Data were submitted using an online data collection portal. The audit is included in the NHS England Quality Accounts list for 2018/2019.

Participants were asked to collect data from ED patient records on consecutive cases who presented to the ED between 1 August 2018 – 31 January 2019.

See Appendix 1 for the audit questions and the standards section of this report for the standards.

Sample size

To maximise the benefit of the new run charts and features RCEM recommended entering 5 consecutive cases per week. This enabled contributors to see their EDs performance on key measures change week by week and visualise any shifts in the data following a quality intervention (PDSA cycle).

Expected patient numbers	Recommended sample size	Recommended data entry frequency
<5 a week	All patients	Weekly
>5 a week	5 consecutive patients	Weekly

Alternative

In case EDs found weekly data entry too onerous, departments were provided guidance on an alternative methodology of entering monthly data instead. The system recorded each patient's arrival date and automatically split the data into weekly arrivals, thereby preserving the benefit of seeing weekly variation.

Expected patient numbers	Alternative sample size	Alternative data entry frequency
<5 a week	All patients	Monthly
>5 a week	20 consecutive patients	Monthly

Pilot methodology

A pilot of the audit was carried out prospectively from 2 to 13 July. This tested the standards, questions, quality of data collectable, as well as the functioning of the online portal and reporting templates.

A number of improvements were made to the final project based on feedback from the pilot sites. RCEM are grateful to contacts from the following trusts for helping with the development of the audit and integrated QIP:

- Frimley Health NHSFT
- St Helens & Knowsley Teaching Hospitals NHS Trust
- Luton & Dunstable University Hospital NHSFT
- North Tees Hospital NHSFT

Standards

The audit asked questions against standards published by RCEM in July 2018:

STANDARD	GRADE
1. Patients triaged to the majors or resuscitation areas of the ED should have the following measured and recorded in the notes within 15 minutes of arrival or triage, whichever is the earliest: • respiratory rate • oxygen saturation • pulse • blood pressure • GCS or AVPU score • temperature	Fundamental
2. Patients with abnormal vital signs, should have their vital signs repeated and recorded in the notes within 60 minutes of the first set of observations	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

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.

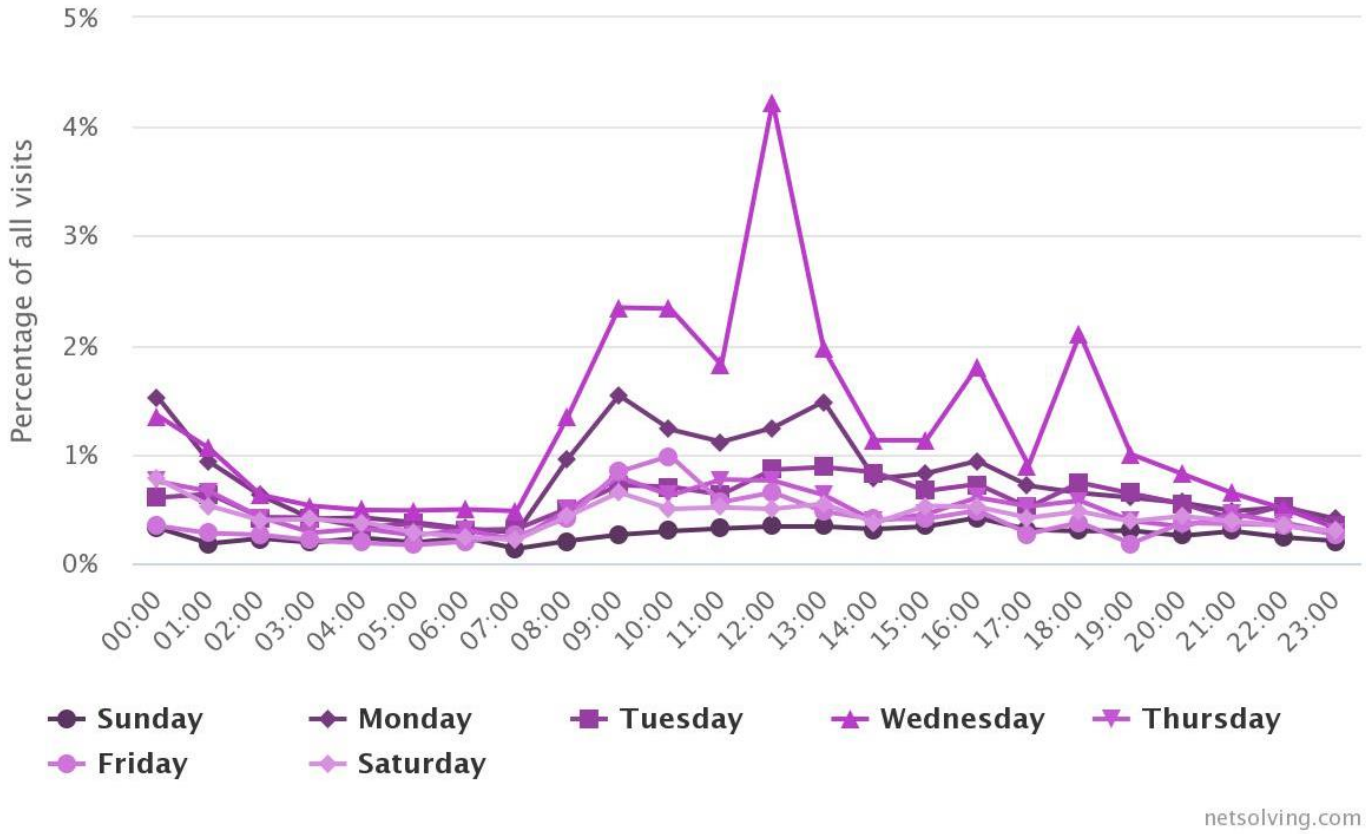
Aspirational: setting longer term goals.

For definitions on the standards, refer to the appendix.

Casemix

National casemix of the patients

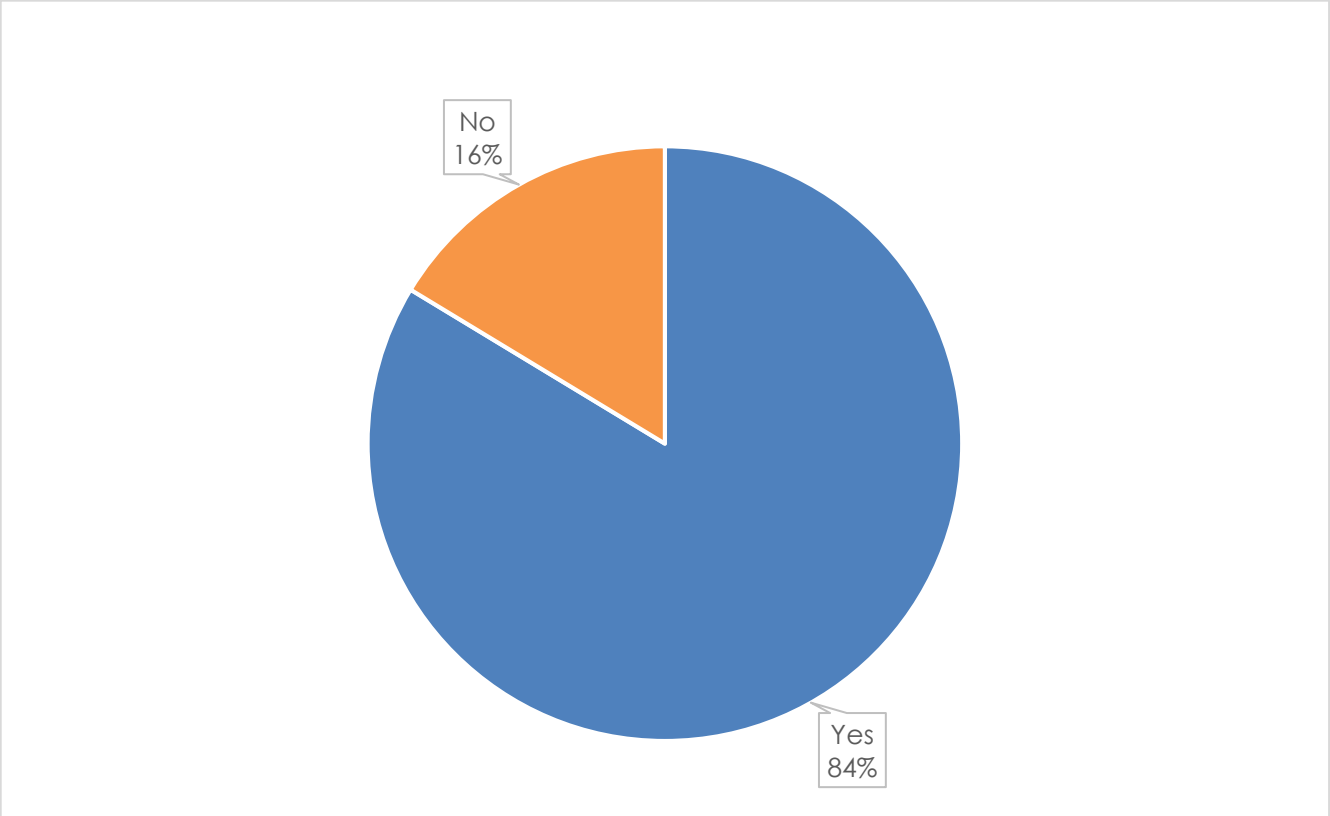
Q1.2: Day and time of arrival or triage (whichever is earlier)



Sample: all patients

The data showed a relatively even split of patient arrivals over the seven days of the week, with the exception of spikes of attendances recorded throughout Wednesdays. There was also a slightly higher proportion of patients attending on a Monday, however, this may be due to EDs choosing a sampling method that selected case notes from the start of the week.

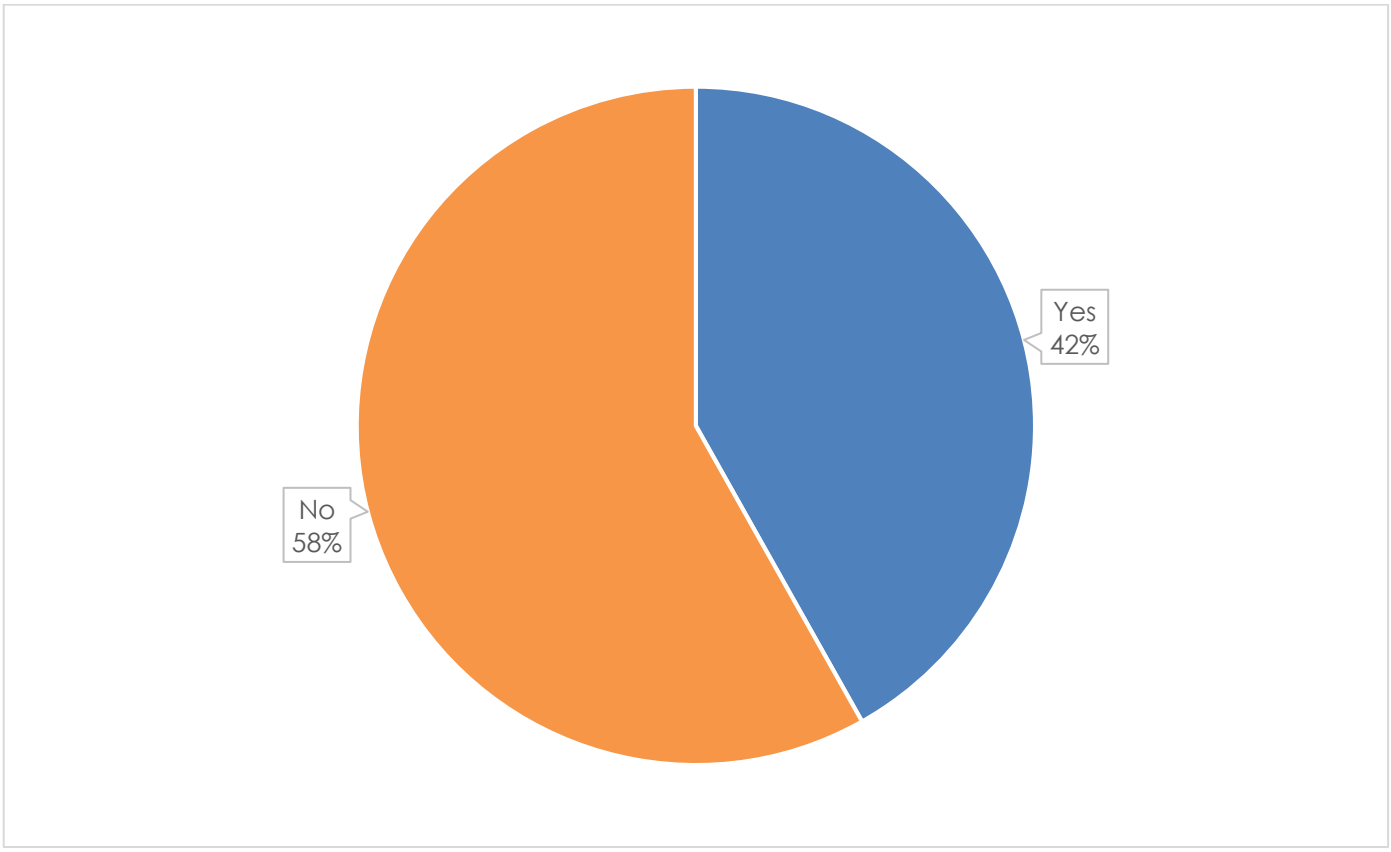
Q2.2: Were the vital signs recorded as a part of a formalised scoring system?



Sample: all patients (national data)

This chart shows the national proportion of patient notes which had vital signs reported as part of a formalised scoring system. Most departments are now using a formalised scoring system, usage was documented in 84% of patient notes included in this audit. These included: NEWS, NEWS2, MEWS, EWS, PAR, EPR alert, CWMS, PAWS, triage, CNS, ViEWS, neurological observation chart, SEWS, initial mental state form, Manchester triage, and sepsis screening tool. Whilst early warning scores are recommended, it may not represent poor practice if they are not used.

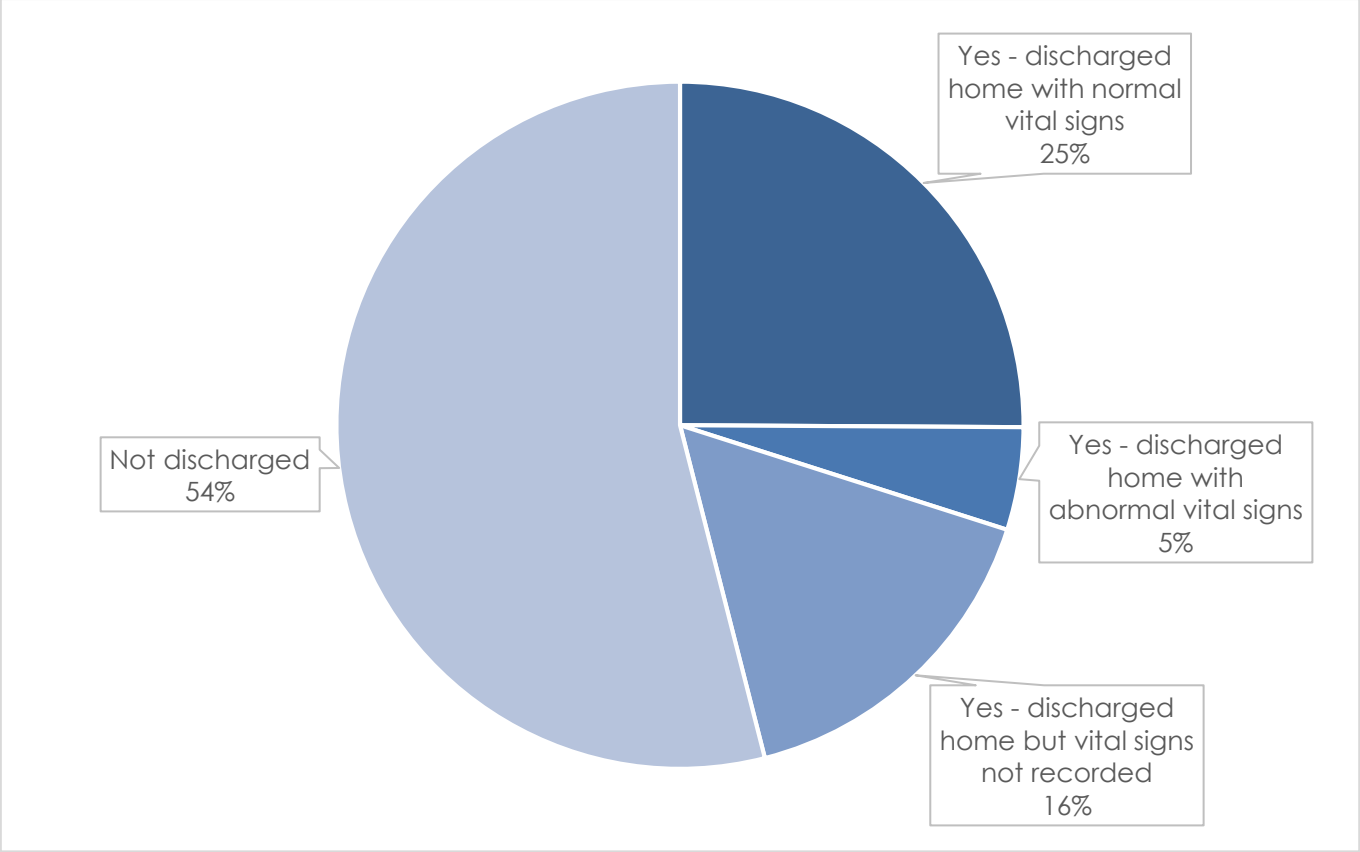
Q3.1: Were any of the recorded vital signs abnormal (as defined in the audit standards)?



Sample: all patients (national data)

This chart shows the national proportion of patient notes in which vital signs were documented as being abnormal. 42% of patients had abnormal vital signs, slightly higher than the 40% when audited in 2010/11 but quite consistent. There was specific evidence in the ED record that the clinician recognised the abnormal vital signs in 72%, and evidence that the action was taken in 73%.

Q5.1: Was the patient discharged home & Q5.1a: When the patient was discharged home, were their vital signs normal?

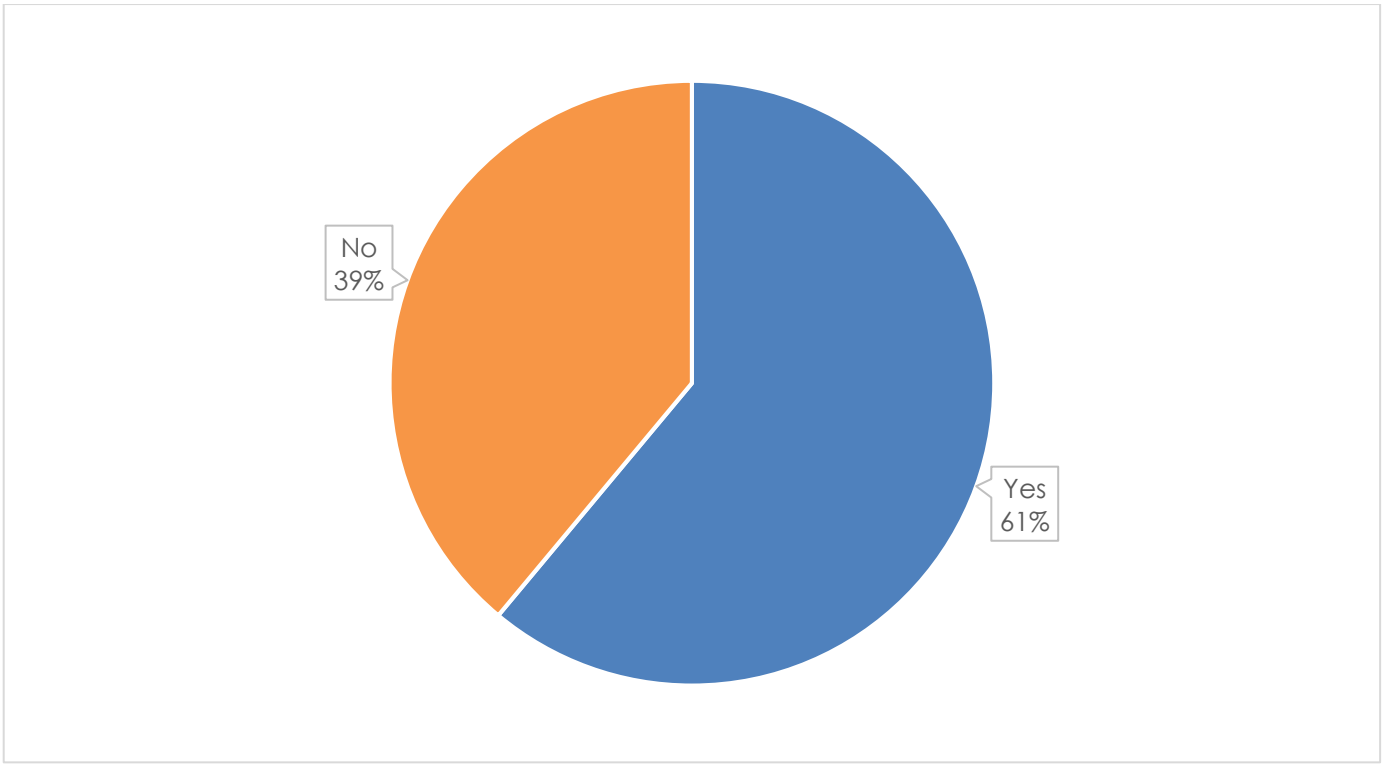


Sample: all patients (national data)

This chart shows the proportion of patients nationally who were discharged home and the documentation of their vital signs. A quarter of patients were discharged with normal vital signs. The concerning groups are those who were discharged with vital signs not recorded and potentially those discharged with abnormal vital signs. The latter group may however represent positive risk taking when linked to a thorough assessment.

Please see appendix 3 for the recommended definitions for abnormal vital signs, however it should be noted that EDs with locally agreed definitions may have used those definitions instead.

Q5.1b: Is there documented evidence of review by a senior doctor (ST4 or above in emergency medicine or equivalent non-training doctor) for discharged patients?



Sample: Q5.1 = yes (national data)

This chart shows the national proportion of notes for discharged patients which had documented evidence of review by a senior doctor. This is not one of the clinical standards, but demonstrates the seniority of ED staff making the important decision of whether to discharge a patient. Just over 60% of discharged patients had documented evidence of review by a senior doctor (ST4 or above in emergency medicine or equivalent non-training doctor).

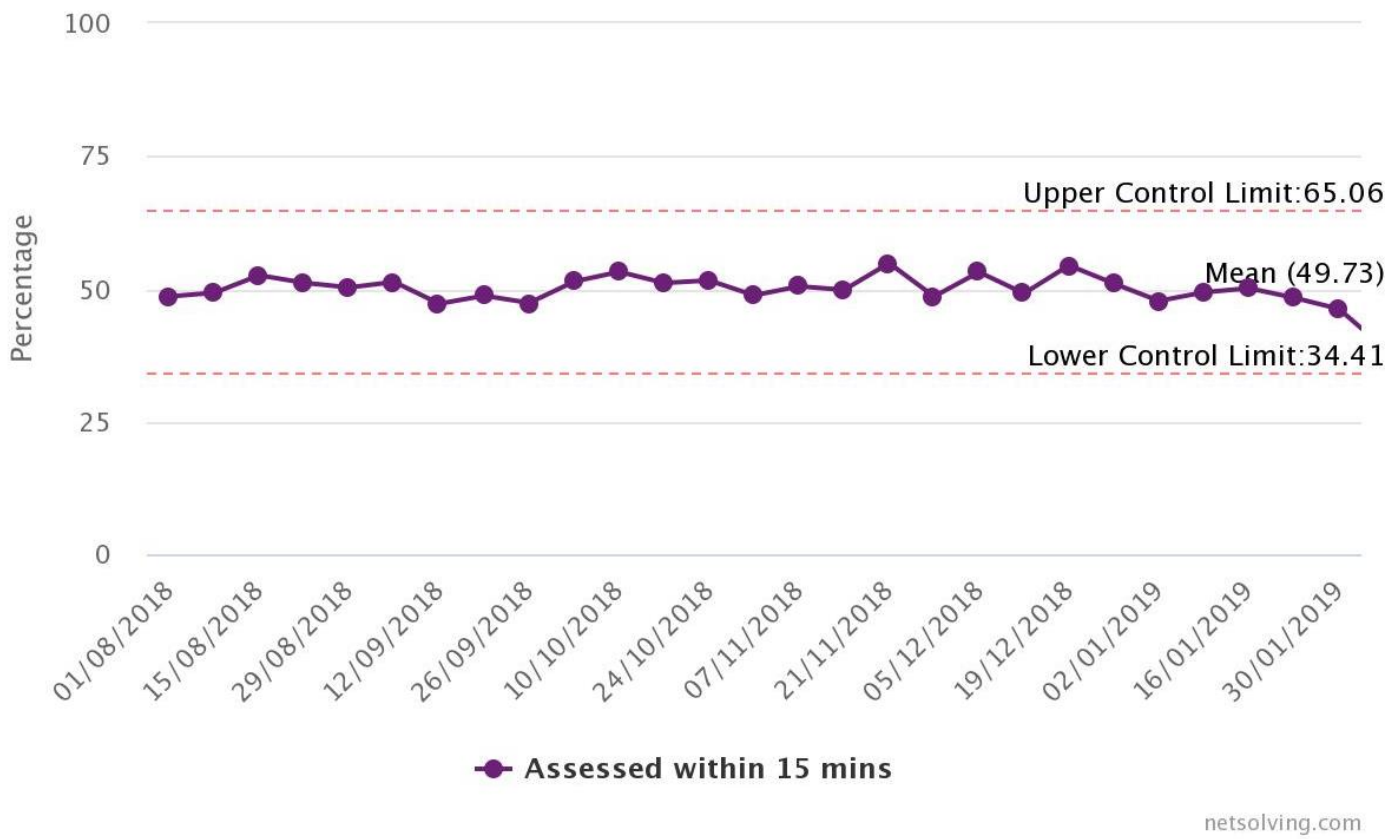
STANDARD 1: Initial assessment of vital signs

See appendix 6 for a guide to understanding these charts.

Fundamental Standard 1: Patients triaged to the majors or resuscitation areas of the ED should have the following measured and recorded in the notes within 15 minutes of arrival or triage, whichever is the earliest:

- respiratory rate
- oxygen saturation
- pulse
- blood pressure
- GCS or AVPU score
- Temperature

Q2.1 Were all six of the above vital signs measured and recorded within 15 minutes?



Sample: all patients

This chart shows no significant national change over the course of the project. It may demonstrate the difficult and complex nature of effecting change, and feedback suggests that departments have used the new QI platform as an audit tool. The aim is for departments to improve over the life cycle of the QIP once familiarity and application of its methodology increases.

The following six graphs (Q21a-f) break down the proportion of patients who have each vital sign measured within 15 minutes of arrival or triage (whichever is earliest), so you can see where EDs are doing well or could make improvements.

Q2.1a: Was respiratory rate measured and recorded within 15 minutes

Sample: all patients

In the previous audit, a median of 62% of patient notes documented respiratory rate within 20 minutes of arrival or triage.

NB: Please be aware that previous reports reported the median value whilst this report reports the mean value. Whilst both the median and mean are ways of expressing an average value, they are different measures and are not directly comparable.

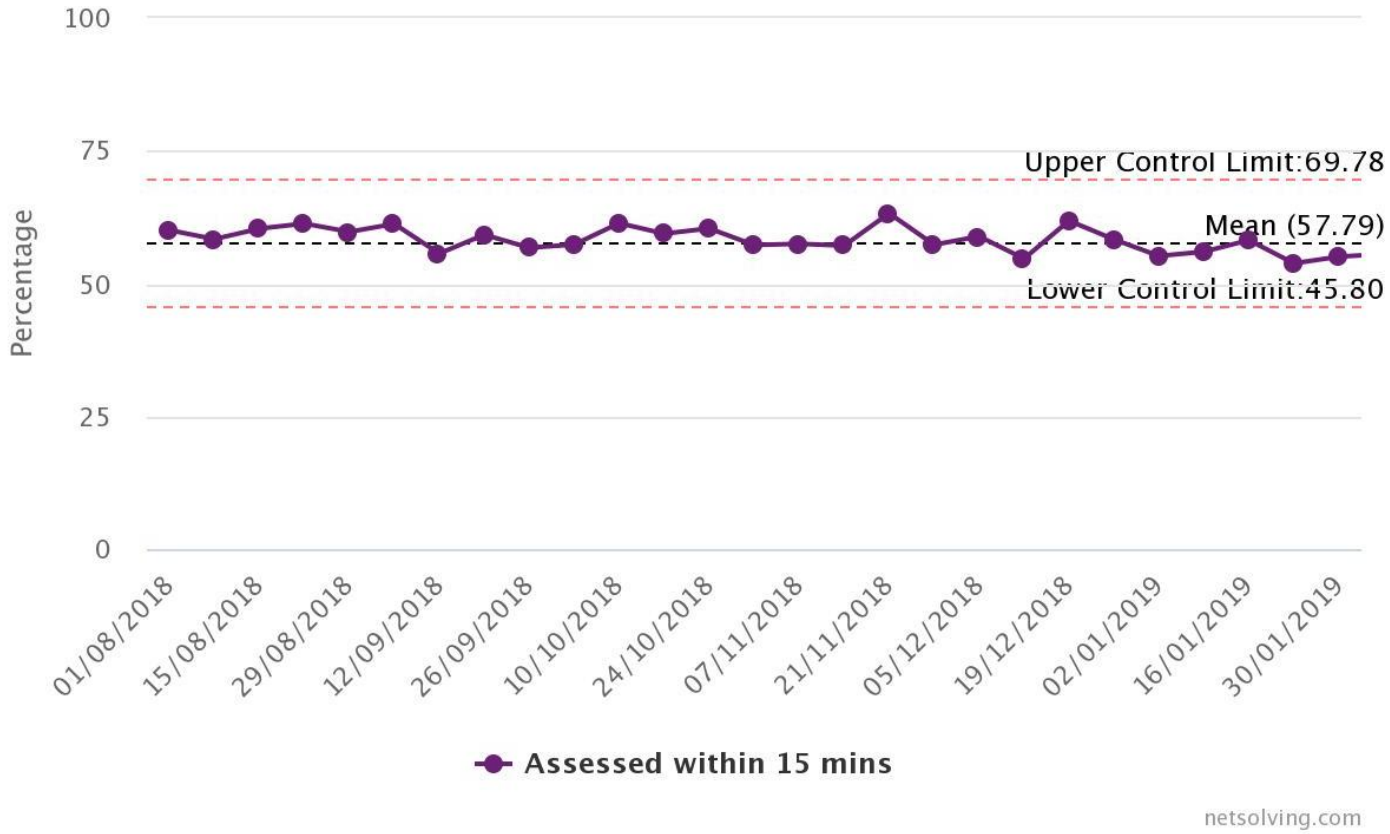
Q2.1b: Was oxygen saturation measured and recorded within 15 minutes

Sample: all patients

In the previous audit, a median of 66% of patient notes documented oxygen saturation within 20 minutes of arrival or triage.

NB: Please be aware that previous reports reported the median value whilst this report reports the mean value. Whilst both the median and mean are ways of expressing an average value, they are different measures and are not directly comparable.

Q2.1c: Was pulse measured and recorded within 15 minutes

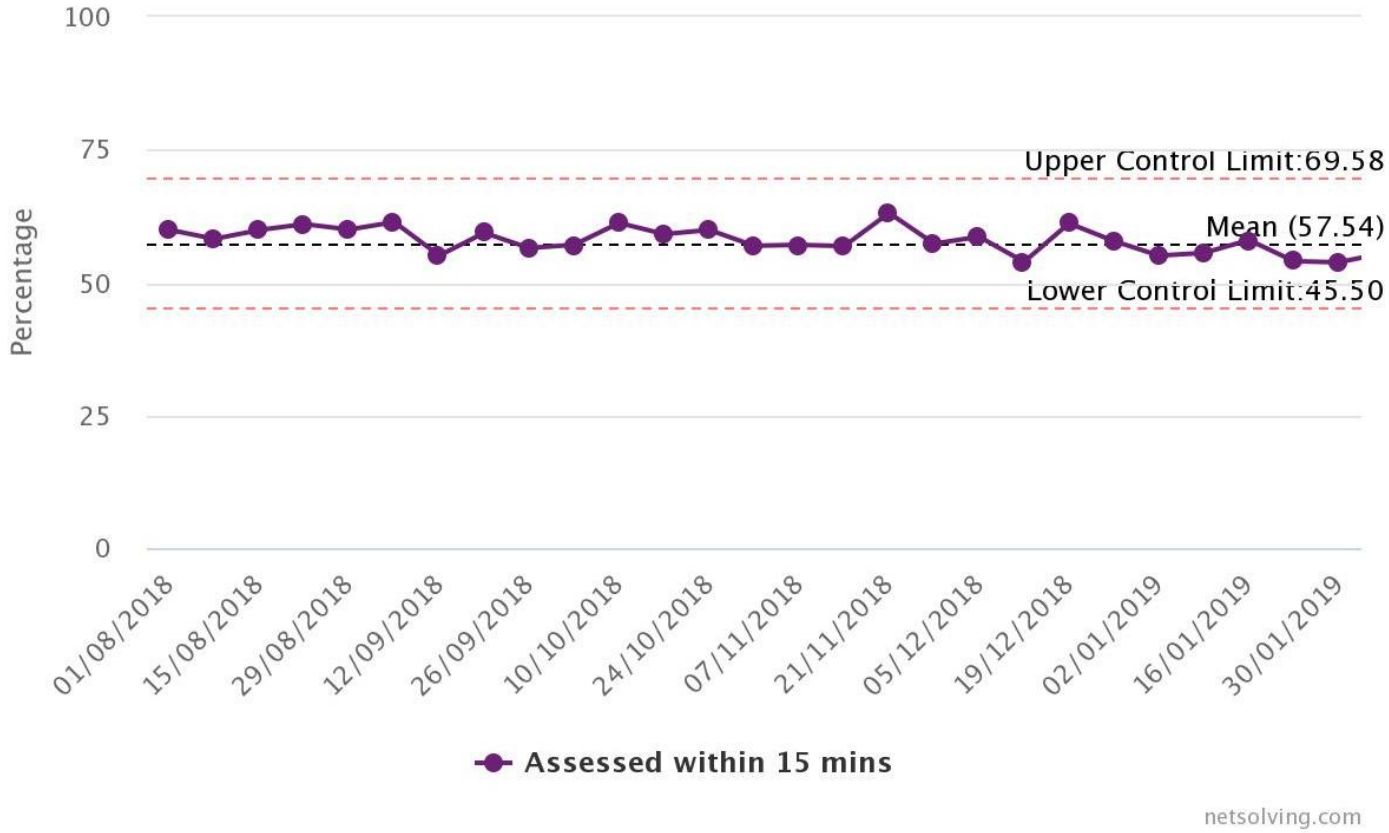


Sample: all patients

In the previous audit, a median of 68% of patient notes documented pulse within 20 minutes of arrival or triage.

NB: Please be aware that previous reports reported the median value whilst this report reports the mean value. Whilst both the median and mean are ways of expressing an average value, they are different measures and are not directly comparable.

Q2.1d: Was Systolic blood pressure measured and recorded within 15 minutes

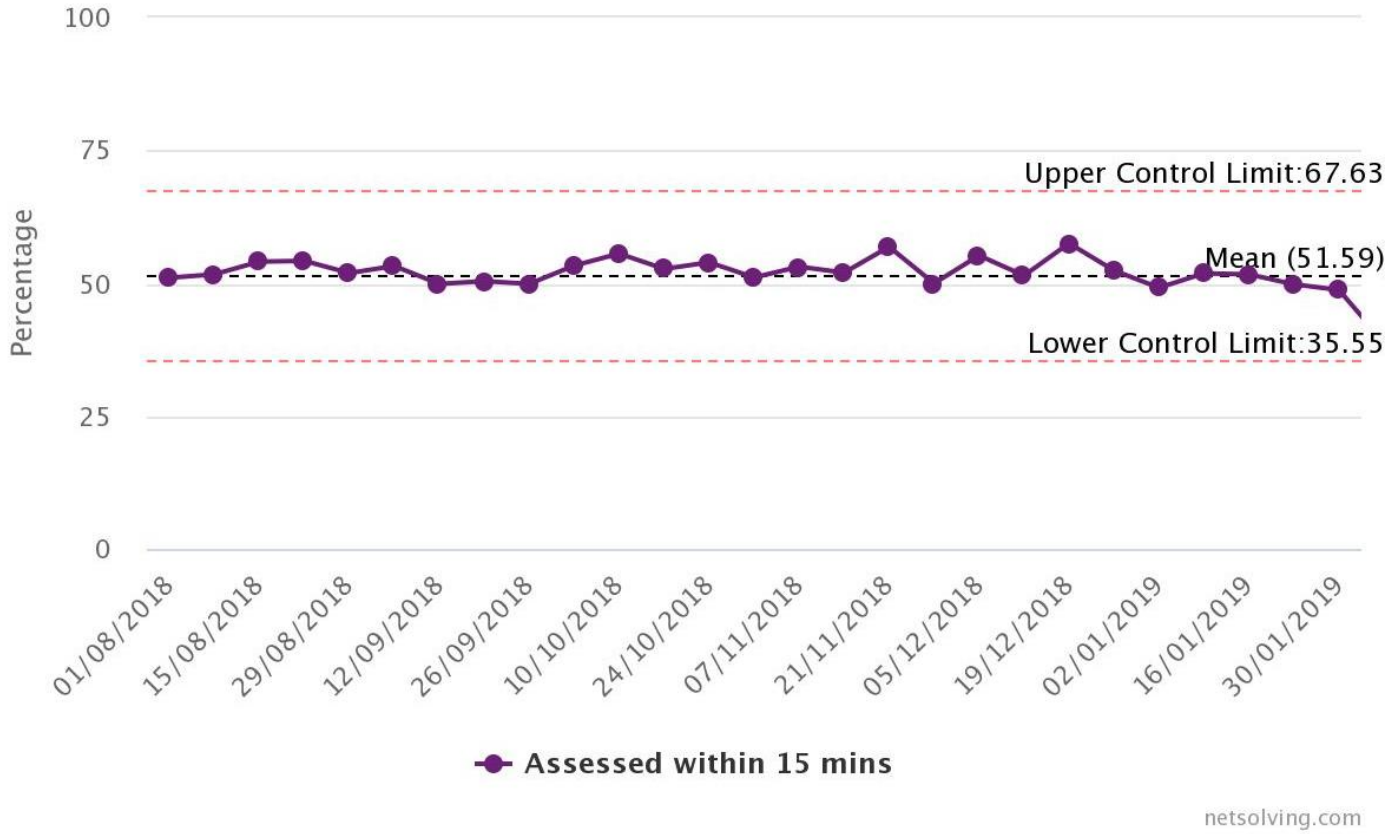


Sample: all patients

In the previous audit, a median of 66% of patient notes documented systolic blood pressure within 20 minutes of arrival or triage.

NB: Please be aware that previous reports reported the median value whilst this report reports the mean value. Whilst both the median and mean are ways of expressing an average value, they are different measures and are not directly comparable.

Q2.1e: Was GCS score (or AVPU) measured and recorded within 15 minutes

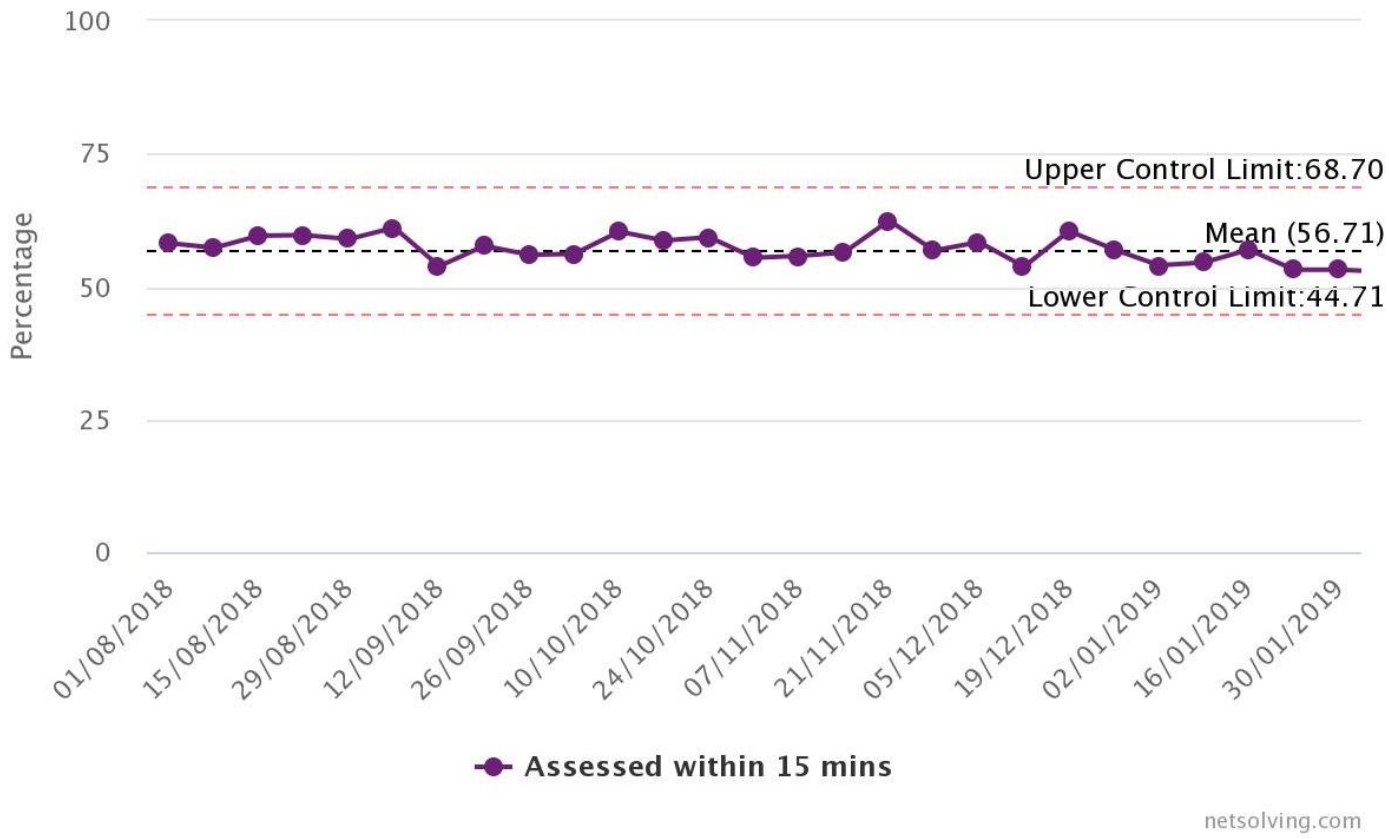


Sample: all patients

In the previous audit, a median of 52% of patient notes documented the GCS score or AVPU within 20 minutes of arrival or triage.

NB: Please be aware that previous reports reported the median value whilst this report reports the mean value. Whilst both the median and mean are ways of expressing an average value, they are different measures and are not directly comparable.

Q2.1f: Was temperature measured and recorded within 15 minutes



Sample: all patients

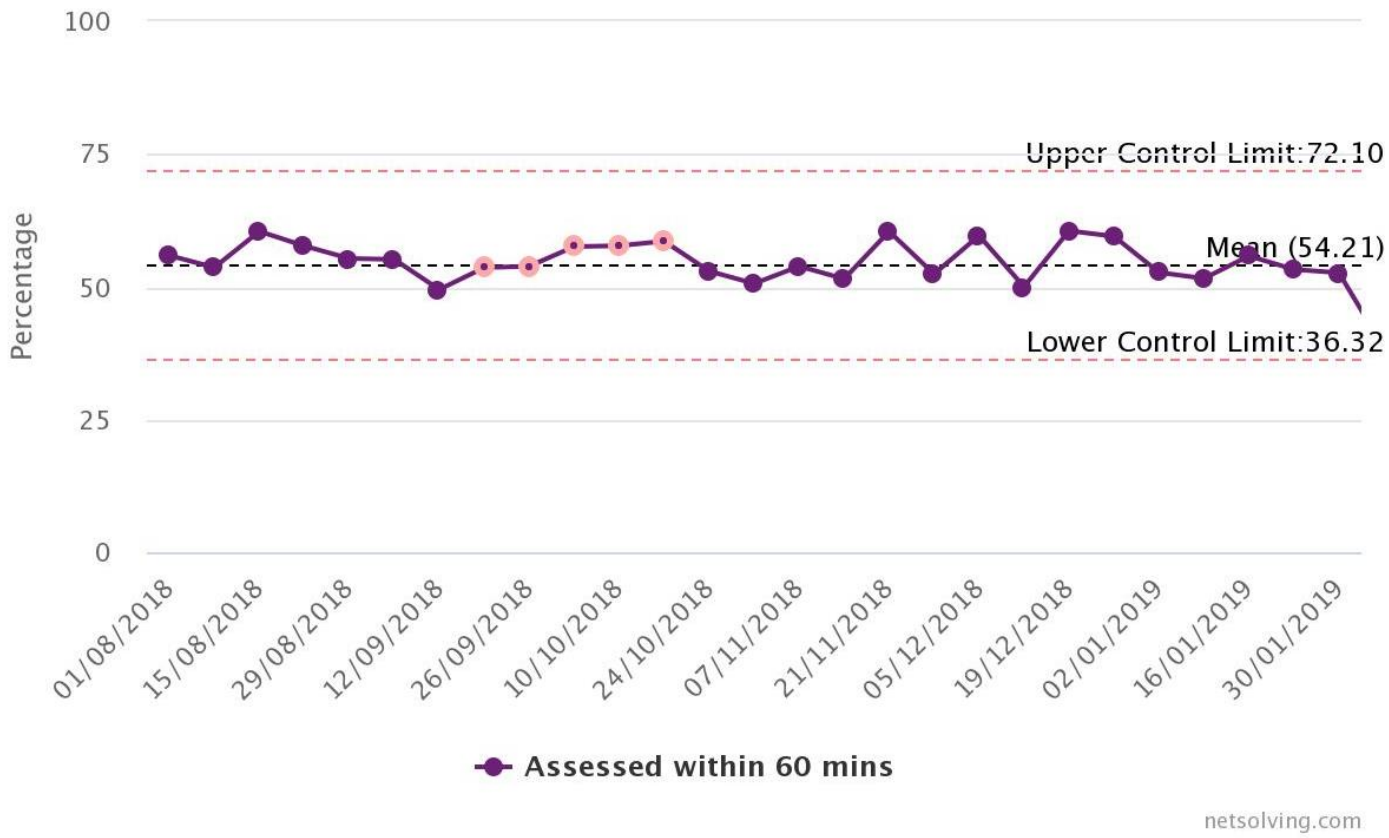
In the previous audit, a median of 60% of patient notes documented temperature within 20 minutes of arrival or triage.

NB: Please be aware that previous reports reported the median value whilst this report reports the mean value. Whilst both the median and mean are ways of expressing an average value, they are different measures and are not directly comparable.

STANDARD 2: Repeated abnormal vital signs

Developmental Standard 2: Patients with abnormal vital signs, should have their vital signs repeated and recorded in the notes within 60 minutes of the first set of observations.

Q4.1: Was a repeat set of vital signs recorded in the ED record?



Sample: Q3.1 = yes

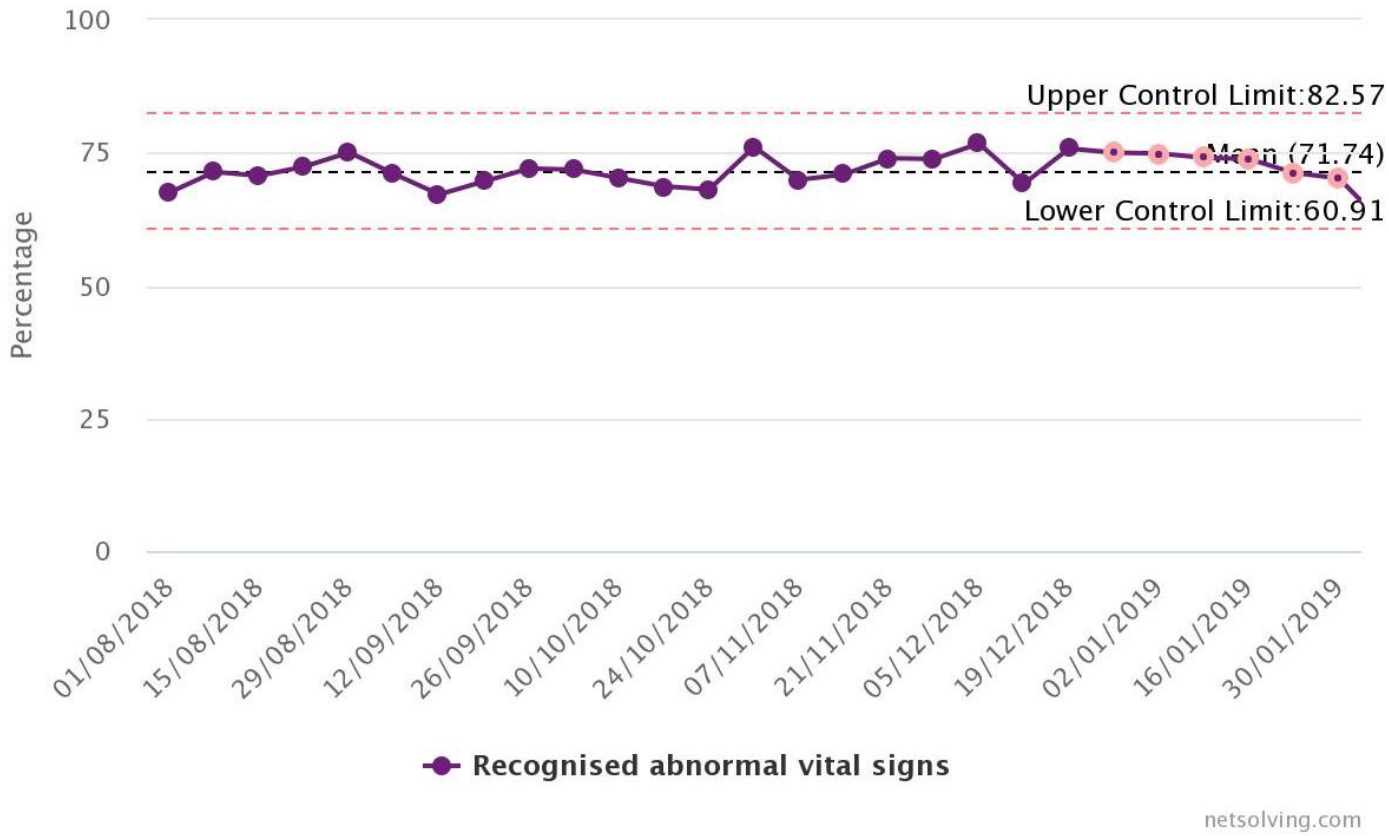
This represents significant national improvement from the previous audit, in which the median value for repeating vital signs within 60 minutes of the first observations was 13-20% for the individual vital signs. When audited in 2010/11 pulse, systolic blood pressure, oxygen saturation and respiration rate were all 20%; GCS score or AVPU, and temperature were both 13%. We congratulate EDs, and encourage continued efforts for timely repeat and documentation for those patients with abnormal vital signs.

NB: Please be aware that previous reports reported the median value whilst this report reports the mean value. Whilst both the median and mean are ways of expressing an average value, they are different measures and are not directly comparable.

STANDARD 3: Abnormal vital signs recognised

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

Q3.1a: Is there specific evidence in the ED record that the clinician recognised the abnormal vital signs?



Sample: Q3.1 = yes

Around 70% of patient records nationally include evidence that the clinician recognised abnormal vital signs.

In the 2010/11 audit different question was asked so no direct comparison can be made. That audit showed that a median of 11% of abnormal vital signs were communicated to the nurse in charge.

STANDARD 4: Abnormal vital signs acted upon

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

Q3.1b: Is there evidence in the ED record that the abnormal vital signs were acted upon?

Sample: Q3.1 = yes

In the previous audit, there was evidence of appropriate action being taken in 48% of cases. There has been significant progress in the process of repeating and acting upon abnormal vital signs. We congratulate EDs for the success in improving this area.

Analysis

Patient data

There has been significant national improvement in the process of repeating and acting upon abnormal vital signs.

In 2010/11, the proportion of patients with abnormal vital signs having repeat observations within 60 minutes was low with a median value of 20% or less for each modality. The upper quartile of Trusts was achieving repeated vital signs within 60 minutes in 36% of patients at best. In this audit, the mean was 54%. This demonstrates the efforts of EDs to improve safety and the early recognition of patients within crowded departments with ever increasing attendances.

The audit does however highlight areas for improvement. There are many patients arriving into the majors area of departments who either have delayed, or incomplete observations.

Over the course of the six-month project there has been no significant change in national performance in any area, however it is encouraging to see that performance against standards remains consistent over the busy winter period. It is however the first year that RCEM and submitting departments have used the project platform and a Quality Improvement approach.

It is likely that many departments have continued with the previous audit approach and not yet fully harnessed the upgraded QI functionality. With increased familiarity and publicity for the new approach, further training as part of the EM curriculum, and QIP examinations there is hope that next year will offer greater results in national quality improvement.

Departments that have demonstrated local improvement are to be commended and are invited to share good practice.

Patient notes exclusions

For the purposes of this audit, the following patient populations were excluded:

- Children or adolescents under the age of 18
- Patients presenting to minors or resus

Summary of recommendations

1. Departments struggling to meet the challenge of measuring a complete set of vital signs within 15 minutes of arrival should review their processes and consider how they can learn from higher performing Trusts

2. Departments are encouraged to use the QI platform to support their QI activities

3. Departments not achieving repeat vital signs within 60 minutes, should review their results and consider how to effect improvement

Using the results of this audit to improve patient care

RCEM would like to extend thanks to all the individuals and emergency departments who participated in this clinical audit and QIP. By participating you have made the first step to making sustainable changes in care – and a lot of you have made many more steps depending how extensively you made use of the PDSA capabilities of the portal.

The results of this QI project should be shared widely with staff who have a responsibility for looking after adult patients triaged to the majors area of the ED, especially the doctors and nurses directly involved in care provision. In addition to the clinical team RCEM recommend sharing the report with the clinical audit and/or quality improvement department, departmental governance meeting, ED Clinical Lead, Head of Nursing and Medical Director as a minimum. Without having visibility of the data and recommendations we cannot expect to see improvements in practice.

Now that EDs have a six-month picture of their weekly performance on key measures RCEM encourages the clinical team and audit department to work together to review the effectiveness of PDSA cycles already completed, and design further cycles to improve performance where the data shows they are required. Engaging staff in the process of action planning and PDSA cycles will lead to more effective implementation and sustainable improvements. The RCEM portal will remain live so that departments can continue to track their performance and evaluate the effects of further PDSA cycles.

For further QI advice and resources, please visit the RCEM Quality Improvement webpage.

Further Information

Thank you for taking part in this clinical audit and QIP. We hope that you find the process of participating and results helpful.

If you have any queries about the report, please e-mail audit@rcem.ac.uk.

Details of the RCEM clinical audit and national QIP Programme can be found under the Current Audits section of the RCEM website.

Feedback

We would like to know your views about this report and participating in this audit and QIP. Please let us know what you think by completing our feedback survey: https://www.surveymonkey.co.uk/r/RCEM_QIP19

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

Useful Resources

- Site-specific report – available to download from the QIP portal (registered users only)
- Online dashboard charts – available from the QIP portal (registered users only). The dashboard remains open after the end of the national QIP project so you can keep monitoring local performance and doing PDSA cycles.
- Local data file – available from the QIP portal (registered users only)
- Guidance on understanding SPC charts
- RCEM Quality Improvement Guide - guidance on PDSA cycles and other quality improvement methods
- RCEM Learning modules on vital signs

Report authors and contributors

This report is produced by the Quality Assurance and Improvement Committee subgroup of the Quality in Emergency Care Committee, for the Royal College of Emergency Medicine.

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Appendices

Appendix 1: Audit questions

Case mix

1.1	Reference (do not enter patient identifiable data)	
1.2	Date and time of arrival or triage – whichever is earlier	dd/mm/yyyy HH:MM

Vital signs

2.1	Were the following vital signs measured and recorded?			
	Tick all applicable:	*Time (leave blank if unknown)*	*Date (for use if different to date of admission)*	*No (select option where applicable)*
	a) Respiratory rate	HH:MM	dd/mm/yyyy	• No – but the reason was recorded • Not recorded
	b) Oxygen saturation	HH:MM	dd/mm/yyyy	• No – but the reason was recorded • Not recorded
	c) Pulse	HH:MM	dd/mm/yyyy	• No – but the reason was recorded • Not recorded
	d) Systolic blood pressure	HH:MM	dd/mm/yyyy	• No – but the reason was recorded • Not recorded
	e) GCS score (or AVPU)	HH:MM	dd/mm/yyyy	• No – but the reason was recorded • Not recorded
	f) Temperature	HH:MM	dd/mm/yyyy	• No – but the reason was recorded • Not recorded
2.2	Were the vital signs recorded as a part of a formalised scoring system?			• Yes (please specify: _____) • No

Abnormal vital signs

3.1	Were any of the recorded vital signs abnormal (as defined in the audit standards)?	• Yes • No
3.1a	➔ If 3.1 = yes: Is there specific evidence in the ED record that the clinician recognised the abnormal vital signs?	• Yes • No
3.1b	➔ If 3.1 = yes: Is there evidence in the ED record that the abnormal vital signs were acted upon?	• Yes • No

Repeat vital sign recording

4.1	Was a repeat set of vital signs recorded in the ED record?		
	Tick all applicable:	*Time (leave blank if unknown)*	*Date (for use if different to date of admission)*
	• Respiratory rate	HH:MM	dd/mm/yyyy
	• Oxygen saturation	HH:MM	dd/mm/yyyy
	• Pulse	HH:MM	dd/mm/yyyy
	• Systolic blood pressure	HH:MM	dd/mm/yyyy
	• GCS score (or AVPU)	HH:MM	dd/mm/yyyy
	• Temperature	HH:MM	dd/mm/yyyy
4.2	(Only answer if YES to 4.1) Were any of the recorded repeat vital signs abnormal (as defined in the audit standards)?	• Yes • No	

Discharge

5.1	Was the patient discharged home?	• Yes • No
5.1a	(Only answer if YES to Q5.1) When the patient was discharged home, were their vital signs normal?	• Yes • No • Not recorded
5.1b	(Only answer if YES to Q5.1) Is there documented evidence of review by a senior doctor (ST4 or above in emergency medicine or equivalent non-training doctor)?	• Yes • No

Notes
(Optional space to record any additional notes for local use)

Appendix 2: Participating Emergency Departments

- ABERDEEN ROYAL INFIRMARY
- ADDENBROOKE'S HOSPITAL
- AINTREE UNIVERSITY HOSPITAL
- AIREDALE GENERAL HOSPITAL
- ALEXANDRA HOSPITAL
- ANTRIM AREA HOSPITAL
- ARROWE PARK HOSPITAL
- BARNET HOSPITAL
- BARNSLEY HOSPITAL
- BASILDON UNIVERSITY HOSPITAL
- BASINGSTOKE AND NORTH HAMPSHIRE HOSPITAL
- BASSETLAW HOSPITAL
- BEDFORD HOSPITAL
- BLACKPOOL VICTORIA HOSPITAL
- BRADFORD ROYAL INFIRMARY
- BRISTOL ROYAL INFIRMARY
- BRONGLAIS GENERAL HOSPITAL
- BROOMFIELD HOSPITAL
- CALDERDALE ROYAL HOSPITAL
- CAUSEWAY HOSPITAL
- CHARING CROSS HOSPITAL
- CHELSEA & WESTMINSTER HOSPITAL
- CHELTENHAM GENERAL HOSPITAL
- CHESTERFIELD ROYAL HOSPITAL
- CITY HOSPITAL
- COLCHESTER GENERAL HOSPITAL
- CONQUEST HOSPITAL
- COUNTESS OF CHESTER HOSPITAL
- COUNTY HOSPITAL
- CRAIGAVON AREA HOSPITAL
- CROYDON UNIVERSITY HOSPITAL
- CUMBERLAND INFIRMARY
- DAISY HILL HOSPITAL
- DARENT VALLEY HOSPITAL
- DARLINGTON MEMORIAL HOSPITAL
- DERRIFORD HOSPITAL
- DIANA, PRINCESS OF WALES HOSPITAL
- DONCASTER ROYAL INFIRMARY
- DORSET COUNTY HOSPITAL
- DR GRAY'S HOSPITAL
- EALING HOSPITAL
- EAST SURREY HOSPITAL
- EASTBOURNE DISTRICT GENERAL HOSPITAL
- EPSOM HOSPITAL
- FAIRFIELD GENERAL HOSPITAL
- FRIMLEY PARK HOSPITAL
- FURNESS GENERAL HOSPITAL
- GEORGE ELIOT A&E
- GLANGWILI GENERAL HOSPITAL
- GLOUCESTERSHIRE ROYAL HOSPITAL
- GOOD HOPE HOSPITAL
- GRANTHAM A&E
- HAIRMYRES HOSPITAL
- HARROGATE DISTRICT HOSPITAL
- HEARTLANDS HOSPITAL
- HILLINGDON HOSPITAL
- HINCHINGBROOKE HOSPITAL
- HOMERTON UNIVERSITY HOSPITAL
- HORTON GENERAL HOSPITAL
- HUDDERSFIELD ROYAL INFIRMARY
- HULL ROYAL INFIRMARY
- JAMES PAGET UNIVERSITY HOSPITAL
- JOHN RADCLIFFE HOSPITAL
- KETTERING GENERAL HOSPITAL
- KING GEORGE HOSPITAL
- KING'S COLLEGE HOSPITAL (DENMARK HILL)
- KING'S MILL HOSPITAL
- KINGSTON HOSPITAL
- LANCASHIRE TEACHING HOSPITALS NHSFT - CHORLEY AND SOUTH RIBBLE HOSPITAL
- LEEDS GENERAL INFIRMARY
- LEIGHTON HOSPITAL
- LINCOLN COUNTY HOSPITAL
- LISTER HOSPITAL
- LUTON & DUNSTABLE HOSPITAL
- MACCLESFIELD DISTRICT GENERAL HOSPITAL
- MANCHESTER ROYAL INFIRMARY
- MANOR HOSPITAL
- MEDWAY MARITIME HOSPITAL
- MILTON KEYNES HOSPITAL
- MORRISTON HOSPITAL
- MUSGROVE PARK HOSPITAL
- NEW CROSS HOSPITAL
- NEWHAM GENERAL HOSPITAL
- NOBLE'S HOSPITAL

- NORFOLK & NORWICH UNIVERSITY HOSPITAL
- NORTH DEVON DISTRICT HOSPITAL
- NORTH MANCHESTER GENERAL HOSPITAL
- NORTH MIDDLESEX HOSPITAL
- NORTHAMPTON GENERAL HOSPITAL (ACUTE)
- NORTHERN GENERAL HOSPITAL
- NORTHUMBRIA SPECIALIST EMERGENCY CARE HOSPITAL
- NORTHWICK PARK HOSPITAL
- NOTTINGHAM UNIVERSITY HOSPITALS NHS TRUST
- PETERBOROUGH CITY HOSPITAL
- PILGRIM HOSPITAL
- PINDERFIELDS GENERAL HOSPITAL
- PRINCE CHARLES HOSPITAL SITE
- PRINCESS ALEXANDRA HOSPITAL
- PRINCESS OF WALES HOSPITAL
- PRINCESS ROYAL HOSPITAL
- PRINCESS ROYAL UNIVERSITY HOSPITAL
- QUEEN ALEXANDRA HOSPITAL
- QUEEN ELIZABETH HOSPITAL (GATESHEAD)
- QUEEN ELIZABETH THE QUEEN MOTHER HOSPITAL
- QUEEN'S HOSPITAL
- QUEEN'S HOSPITAL, BURTON UPON TRENT
- ROTHERHAM DISTRICT GENERAL HOSPITAL
- ROYAL BERKSHIRE HOSPITAL
- ROYAL BLACKBURN HOSPITAL
- ROYAL BOLTON HOSPITAL
- ROYAL BOURNEMOUTH GENERAL HOSPITAL
- ROYAL CORNWALL HOSPITAL (TRELISKE)
- ROYAL DERBY HOSPITAL
- ROYAL DEVON & EXETER HOSPITAL (WONFORD)
- ROYAL FREE HOSPITAL
- ROYAL GWENT HOSPITAL
- ROYAL HAMPSHIRE COUNTY HOSPITAL
- ROYAL INFIRMARY OF EDINBURGH
- ROYAL LANCASTER INFIRMARY
- ROYAL OLDHAM HOSPITAL
- ROYAL PRESTON HOSPITAL
- ROYAL SHREWSBURY HOSPITAL
- ROYAL STOKE UNIVERSITY HOSPITAL
- ROYAL SURREY COUNTY HOSPITAL
- ROYAL SUSSEX COUNTY HOSPITAL
- ROYAL UNITED HOSPITAL
- ROYAL VICTORIA HOSPITAL
- RUSSELLS HALL HOSPITAL
- SALFORD ROYAL
- SALISBURY DISTRICT HOSPITAL
- SANDWELL GENERAL HOSPITAL
- SCARBOROUGH GENERAL HOSPITAL
- SCUNTHORPE GENERAL HOSPITAL
- SOUTH TYNESIDE DISTRICT HOSPITAL
- SOUTHAMPTON GENERAL HOSPITAL
- SOUTHEND HOSPITAL
- SOUTHMEAD HOSPITAL AWP
- SOUTHPORT GENERAL INFIRMARY
- ST GEORGE'S HOSPITAL (TOOTING)
- ST HELIER HOSPITAL
- ST JAMES'S UNIVERSITY HOSPITAL
- ST JOHN'S HOSPITAL AT HOWDEN
- ST MARY'S HOSPITAL
- ST MARY'S HOSPITAL (HQ)
- ST PETER'S HOSPITAL
- ST RICHARD'S HOSPITAL
- ST THOMAS' HOSPITAL
- STEPPING HILL HOSPITAL
- STOKE MANDEVILLE HOSPITAL
- SUNDERLAND ROYAL HOSPITAL
- TAMESIDE GENERAL HOSPITAL
- THE GREAT WESTERN HOSPITAL
- THE IPSWICH HOSPITAL
- THE JAMES COOK UNIVERSITY HOSPITAL
- THE MAIDSTONE HOSPITAL
- THE PRINCESS ELIZABETH HOSPITAL
- THE PRINCESS ROYAL HOSPITAL
- THE QUEEN ELIZABETH HOSPITAL, KING'S LYNN, NHS FOUNDATION TRUST
- THE ROYAL GLAMORGAN HOSPITAL
- THE ROYAL LIVERPOOL UNIVERSITY HOSPITAL
- THE ROYAL LONDON HOSPITAL
- THE ROYAL VICTORIA INFIRMARY
- THE TUNBRIDGE WELLS HOSPITAL
- THE WHITTINGTON HOSPITAL
- TORBAY HOSPITAL

- ULSTER HOSPITAL
- UNIVERSITY HOSPITAL LEWISHAM
- UNIVERSITY HOSPITAL OF NORTH DURHAM
- UNIVERSITY HOSPITAL OF NORTH TEES
- UNIVERSITY HOSPITAL OF WALES
- UNIVERSITY HOSPITALS COVENTRY AND WARWICKSHIRE NHS TRUST
- 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
- WILLIAM HARVEY HOSPITAL (ASHFORD)
- WISHAW GENERAL HOSPITAL
- WITHYBUSH GENERAL HOSPITAL
- WORCESTERSHIRE ROYAL HOSPITAL
- WORTHING HOSPITAL
- WREXHAM MAELOR HOSPITAL
- WYTHENSHAWE HOSPITAL
- YEOVIL DISTRICT HOSPITAL
- YSBYTY GWYNEDD

Appendix 3: Definitions

Standards definitions:

Standard	Term	Definition
2	Abnormal vital signs	The following criteria may be used to define abnormal vital signs in adults which should be acted on (if you have locally defined abnormal vital signs you may use those instead): a) Respiratory rate < 10 **or** > 20 per min b) Oxygen saturation < 92% c) Pulse < 60 **or** > 100 d) Systolic blood pressure < 100 **or** > 180 e) GCS < 15 or less than Alert on AVPU f) Temperature < 35 **or** > 38 g) MEWS score ≥2 = "abnormal parameters"

Question and answer definitions:

Term	Definition
Discharged home	Home or their normal place of residence
Abnormal vital signs	The following criteria may be used to define abnormal vital signs in adults which should be acted on (if you have locally defined abnormal vital signs you may use those instead): h) Respiratory rate < 10 **or** > 20 per min i) Oxygen saturation < 92% j) Pulse < 60 **or** > 100 k) Systolic blood pressure < 100 **or** > 180 l) GCS < 15 or less than Alert on AVPU m) Temperature < 35 **or** > 38 n) MEWS score ≥2 = "abnormal parameters"

Appendix 4: Calculations

This section explains how the RCEM team have analysed your data. You are welcome to use this analysis plan to conduct local analysis if you wish. Analysis sample tells you which records were included or excluded from the analysis. The analysis plan tells you how the dashboard charts were graphed and which patient notes met or failed the standards.

STANDARD	GRADE	Analysis sample	Analysis plan – conditions for the standard to be met
1. Patients triaged to the majors or resuscitation areas of the ED should have the following measured and recorded in the notes within 15 minutes of arrival or triage, whichever is the earliest: • respiratory rate • oxygen saturation • pulse • blood pressure • GCS or AVPU score • temperature	F	All patients	Met: 2.1 within 15 mins of 1.2 Not met: all other cases SPC chart for each of the following: •respiratory rate • oxygen saturation • pulse • blood pressure • GCS or AVPU score • temperature
2. Patients with abnormal vital signs, should have their vital signs repeated and recorded in the notes within 60 minutes of the first set of observations	D	Include: 3.1 = yes	Met: 4.1 within 60 mins of 1.2 Not met: all other cases
3. There should be explicit evidence in the ED record that the clinician recognised the abnormal vital signs (if present).	D	Include: 3.1 = yes	Met: 3.1b = yes Not met: all other cases
4. There should be documented evidence that the abnormal vital signs (if present) were acted upon in all cases.	F	Include: 3.1 = yes	Met: 3.1b = yes Not met: all other cases

Appendix 5: Inclusion and exclusion criteria

Inclusion criteria

Patients must meet the following criteria for inclusion:

- Adults **18 years of age and over**
- Presenting to an ED
- Triaged to the majors area of the ED

Exclusion criteria

Do **not** include:

- Children or adolescents under the age of 18
- Patients presenting to minors or resus

Appendix 6: Understanding your results

Statistical process control (SPC) charts

The charts in this report and your new online dashboard can tell you a lot about how your ED is performing over time and compared to other EDs. If you're not used to seeing data in this way it can take a little time to get used to. This section of the report will help you understand the charts and interpret your own data.

The main type of chart is known as a **Statistical Process Control (SPC) chart** and plots your data every week so you can see whether you are improving, if the situation is deteriorating, whether your system is likely to be capable to meet the standard, and also whether the process is reliable or variable.

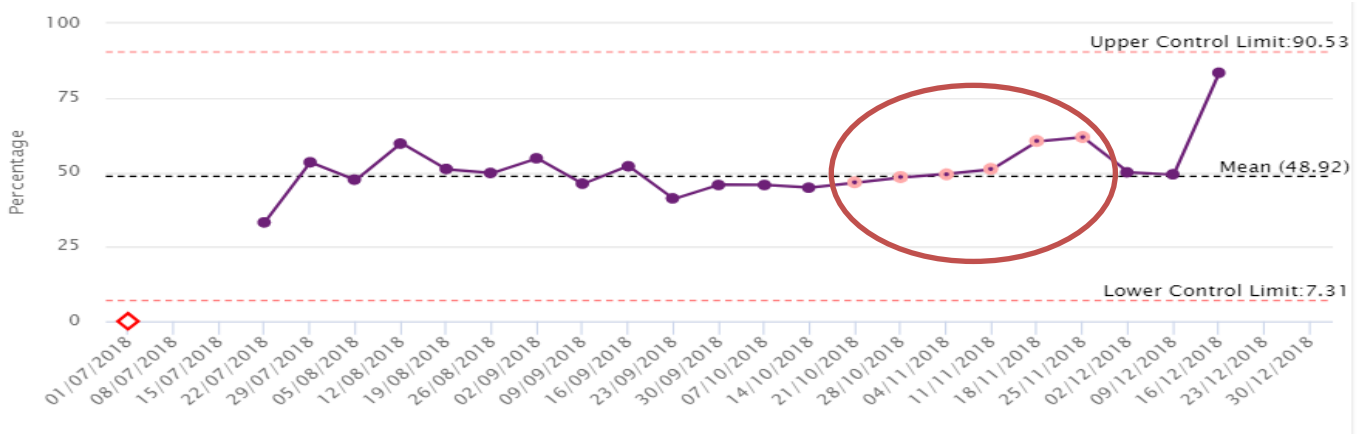
As well as seeing your actual data plotted each week you will see a black dotted average line, this is the **mean** percentage of patients. The SPC chart will point out if your data has a run of points above (or below) the mean by changing the dots to white. If your data is consistently improving (or deteriorating) the dots will turn red so the trend is easy to spot. If a positive run or trend of data happens when you're trying a PDSA/change intervention this is a good sign that the intervention is working.

As well as the dotted mean line, you will see two other lines which are known as the **upper and lower control limits**. The control limits are automatically determined by how variable the data is. Around 99% of all the data will fall between the upper and lower control limits, so if a data point is outside these lines you should investigate why this has happened.

Interpreting your data

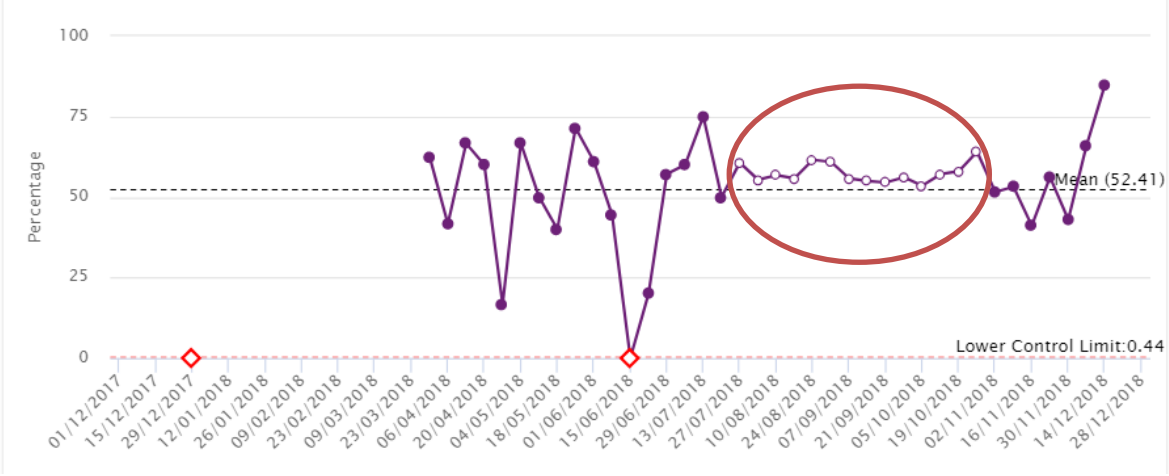
1. **Performance is improving (or deteriorating)**

A consistent run of data points going up or down with be highlighted with **red dots** so they are easy to spot. A run of data going up is a good sign that your service is making improvements that are really working. If the data is going down this may indicate that service is deteriorating for some reason – watch out for a lack of resources or deterioration as a result of a change somewhere else in the system.



2. Performance is consistently above (or below) the mean

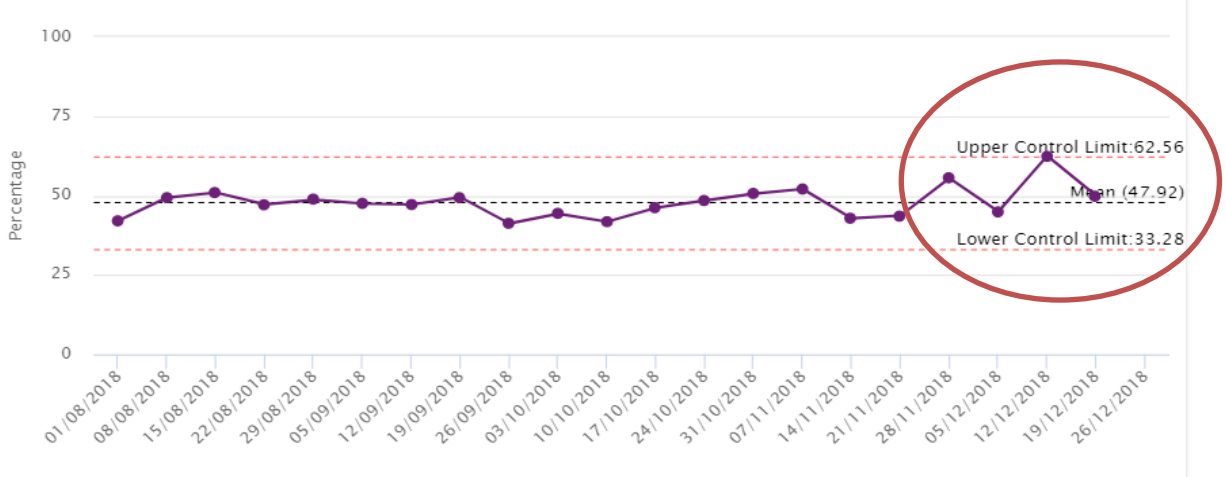
A consistent run of data that is above or below the mean will be highlighted with **white dots** so they are easy to spot. If your data has been quite variable this is a good sign that the process is becoming more reliable.



3. Is your system likely to be capable of meeting the standard?

The **control limits** show where you can assume 99% of your data will be. If you find that the standard is outside your control limits, it is very unlikely that your system is set up to allow you to meet the standard. If you do achieve the standard, this will be an unusual occurrence and very unlikely to be sustained. If this is the case, it is recommended that you look at how the process can be redesigned to allow you to meet the standard.

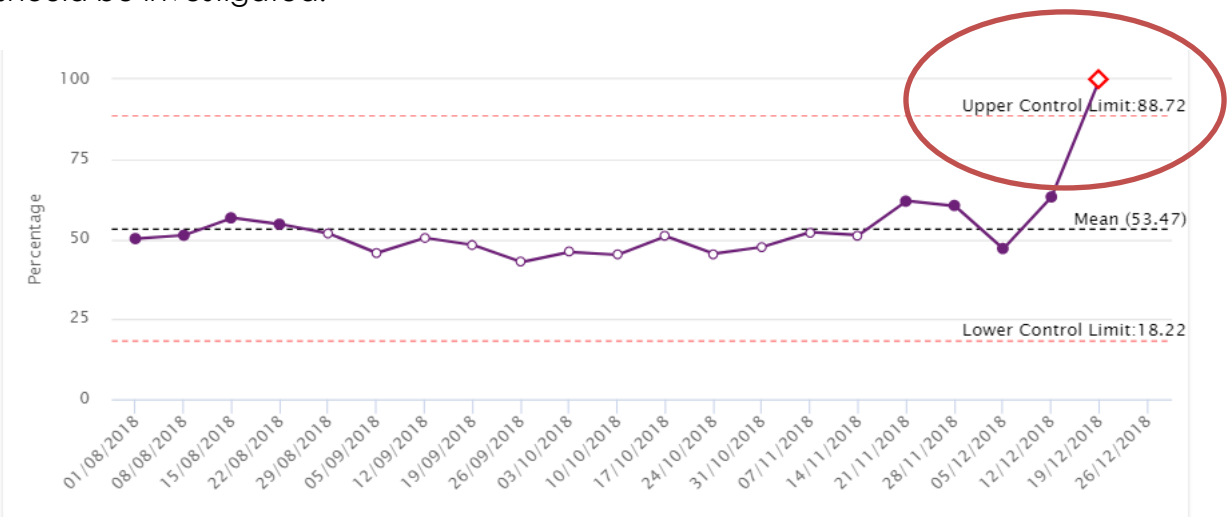
In the below example, the process is performing consistently at around 50%. The control limits show us that most of the time we would expect the process to be between 33% - 62%. If the standard for this process was 50%, then the process is well designed. If, however, the standard was 75% then the chart warns us that the system is not currently set up to allow the process to achieve the standard.



5. Something very unusual has happened!

The majority of your data should be inside the upper and lower control limits, these are automatically calculated by the system. If a single data point falls outside these limits then something very unusual has happened. This will be flagged up with a **red diamond** so you can spot it.

In some cases it may mean that the data has been entered incorrectly and should be checked for errors. It may also mean that something unexpected has had a huge impact on the service and should be investigated.



Appendix 7: References

1. **Royal College of Emergency Medicine.** *Vital signs in majors.* 2011.
2. **RCEM.** *Tracking Emergency Department Crowding.* 2015.

Appendix 8: Template to submit your QI initiatives for publication on the RCEM website

If you would like to share details of your QI initiative or PDSA cycle with others, please complete this document and email it to audit@rcem.ac.uk.

Name: _____

Email address:_____

Hospital: _____

Trust: _____

Plan State the question you wanted to answer – what was your prediction about what would happen? What was your plan to test the change (who, what, when, where)? What data did you collect? How did you plan to collect it?	
Do How did you carry out the change? Did you come across any problems or unexpected observations? How did you collect and analyse the data?	
Study What did the analysis of your results show? How did it compare to your predictions? Summarise and reflect on what you learnt.	
Act Based on what you learnt, what did you adapt (modify and run in another test), adopt (test the change on a larger scale) or abandon?	

Did you prepare for another PDSA based on your learning?	
Reflection and learning What did you and the team learn from this QI initiative? What advice would you give to someone else in your position?