Ambulatory Emergency Care

Guide to measurement for improvement

November 2012

Introduction

One of the key pressures facing all healthcare economies in the NHS is managing the continually increasing demand for emergency care while also reducing the number of inpatient beds in order to meet cost reduction targets. Ambulatory Emergency Care (AEC) is a different model of service delivery that has the potential to help manage this increasing demand without requiring additional inpatient resources.

The underlying principle of AEC is that a significant proportion of adult patients who require emergency care can be managed safely and appropriately on the same day without admission to a hospital bed. If implemented effectively, AEC has the potential to provide high quality emergency care and a good patient experience in a cost effective way.

"All improvement will require change, but not all change will result in improvement."

G. Langley et al.
The Improvement
Guide, 1996

Using data and information to understand, demonstrate and communicate the impact of potential changes in how services are delivered is essential.

This guide brings together learning from the Ambulatory Emergency Care Delivery Network on measurement for improvement when developing AEC services.

The AEC Delivery Network was facilitated by a national team of improvement and subject experts, who supported local teams from organisations across NHS England to accelerate the implementation of AEC services.

These teams typically consisted of clinicians and managers from acute trusts, primary care and commissioning organisations, working together to drive and accelerate the implementation of AEC services. The learning that is outlined in this guide comes from the practical experience of supporting the teams participating in the network.

The College of
Emergency Medicine

Royal College
of Nursing
The voice of nursing in the UK

sam
THE SOCIETY FOR ACUTE MEDICINE

"Ambulatory emergency care as a concept parallels the innovation that day case surgery has brought to elective surgery and could transform care delivery for a substantial number of patients who are currently admitted to a hospital bed."

**Professor
Matthew Cooke**
National Clinical Director
for Urgent and
Emergency Care

Key considerations when planning to implement AEC

Health economies need to measure the impact of establishing AEC services on the flow of patients requiring emergency care across the whole local health and care economy. As the main benefit of AEC service development is the reduction in the need for inpatient beds, the focus for measurement is to demonstrate this benefit, alongside improving patient experience and outcomes.

The specific questions to be addressed are:

- Who are the patients?

- How do they currently receive services in hospital in an emergency?

- How could they receive services in an emergency in the future?

As AEC services are established, the following sets of questions provide a good focus for understanding how well the service is meeting its aims in comparison to the baseline (ie before AEC services were in place):

- How effective is the decision making?

- How many patients go down the right emergency care pathway?

- How effective is the AEC service?

– Are fewer patients being readmitted in an emergency?

– Are their clinical outcomes of AEC services the same or better than before?

This guide is designed to provide practical advice on how to answer these key questions. This will help to ensure that the establishment of AEC services delivers the desired benefits.

There are four parts to the guide:

Part 1

Places AEC in the context of emergency patient flows.

Part 2

Explains what measurement for improvement is and how it differs from other sorts of measurement that you might have come across.

Part 3

Describes the seven steps to measurement for improvement: the process of collecting, analysing and reviewing data.

Part 4

Describes run charts and statistical process control charts – two key analytical tools that you can use to measure your improvement.

"Improving patients' experience of care and their outcomes is a central aim to any AEC service development."

Carolyn Robertson
Programme Lead for AEC
Delivery Network

1.

AEC and emergency patient flows

AEC and emergency patient flows

AEC – same day emergency care

The Royal College of Physicians – Acute Medicine Task Force has produced a working definition of AEC:

> "Ambulatory care is clinical care which may include diagnosis, observation, treatment, and rehabilitation, not provided within the traditional hospital bed base or within the traditional out-patient services that can be provided across the primary/secondary care interface".

It is same day emergency care, where the intention is to provide the care that the patient requires on the same day, where traditionally they may have expected to have been admitted to a hospital bed for treatment or to await diagnosis.

Coding: a critical issue for demonstrating impact

Through our work with the organisations participating in the network, we have learnt that:

– demonstrating the impact of AEC is not straightforward

– how short stay emergency care activity is categorised and coded varies hugely.

The impact of AEC will be demonstrated in different ways, depending on what measures are regularly used to illustrate overall emergency flow and how AEC activity is collected and categorised for example:

If AEC activity is coded as an *admission*, and the same patient groups were previously coded as an admission, you can expect:

– in-patient bed days used for unplanned care to reduce (as the AEC patients will be turned around more quickly so use less bed days)

– average length of stay will reduce

– the number of emergency admissions will stay consistent

– the number of emergency re-admissions within 30 days are likely to stay the same (or reduce).

One of the clear benefits of implementing AEC for acute trusts and commissioners is that they should expect a reduction in emergency bed-days used.

If AEC activity is coded as *not being an admission*, you can expect:

– in-patient bed days used for unplanned care to reduce

– average length of stay will increase (as short stay patients being treated in AEC are now not included in the inpatient data)

– the number emergency admissions will reduce

– the number of emergency re-admissions within 30 days will reduce (as any patients who do come back in to the hospital will not have been previously classified as an admission).

Please go to the section "Part 2: What is measurement for improvement" for further detail on this important issue.

The Directory of Ambulatory Emergency Care for Adults lists 49 clinical conditions based on HRG codes and ICD-10 diagnosis codes that can be treated (at least for a certain proportion of patients) in an emergency ambulatory way. The Directory is not designed to be used as a demand management tool or as a performance management tool, and is not an exhaustive list of conditions. In particular, we know that there are variations in coding of short stay emergency care between health economies; this means, **any analysis will need to be interpreted within the local context for it to be meaningful.**

AEC and emergency patient flows

Who are the patients?

How do they currently access and receive services in an emergency?

How could they access and receive services in the future in an emergency?

A hospital's baseline and therefore the assessment of impact for AEC, is the "pre-AEC" emergency patient flow.

The following Figures (1 and 2) illustrates the flow of emergency patients "before" and "after" AEC has been introduced.

As you develop and make decisions on your approach to delivering AEC, you can predict the potential impact that AEC services should have on emergency patient flow in your system. For example, The Whittington Hospital NHS Trust established AEC services with the aim of preventing unnecessary emergency admissions, and speeding up discharge from hospital for "short stay" patients.

Prior to AEC services being developed, their emergency patient flows looked like the those illustrated in Figure 1. In a 6 month period, approximately 46,000 patients attended the emergency department (ED) and/or the urgent care centre. Around 9,500 were admitted to the hospital, with under half of these patients being admitted to a ward. Their planned AEC service aimed to reduce emergency admissions and speed up the discharge of short stay emergency patients. At the outset therefore the team expected AEC services to reduce emergency admissions to the ward.

Figure 1:
Whittington Hospital before AEC.

Figure 2 shows this anticipated impact and the AEC related emergency patient flows. The AEC service is co-located with the urgent care centre and any patient who is discharged directly from the AEC service will prevent a ward level admission. Any patient who is admitted via the Medical Assessment Unit (MAU) but is treated by the Ambulatory Unit will also prevent a ward level admission. The impact of AEC is estimated to reduce ward admissions by 4.5% based on the first 51 days of the service being in operation and the unit's activity data.

Figure 2:
Whittington Hospital after AEC.

To gain a good understanding of your emergency flow, it is important to include activity numbers that relate to each part of the process/flow.

When developing your measurement plan, you need to ensure that it enables you to monitor whether your AEC service is generating new demand or converting existing demand to AEC activity or a combination of the two.

The detail: coding and AEC: when is a patient admitted?

National guidance (see Appendix 1) indicates that the patient's treatment should dictate patient classification around their admission status. The Audit Commission (2012) report 'By Definition' highlighted that successful local health economies have followed a consistent principle:

"an admission occurs only when a patient needs a bed because of their immediate condition or to recover from a procedure."

Within these successful economies, there are agreements between providers and commissioners to code based on pathways of care. Another issue highlighted by the Audit Commission report relevant to AEC is where trusts have "adopted urgent outpatient attendance to manage emergency patients who do not necessarily require an admission... PbR guidance does allow for use of local prices but emergency outpatient activity cannot be identified in the data."

Figure 3 illustrates how AEC activity can cover both same day emergency outpatients and inpatient activity.

Figure 3:
AEC activity covers inpatient and outpatient activity.

AEC services generally provide care to patients where a patient does not need to lie down, but provide 'chairs' that can readily be converted to a 'bed' if a patient either needs a bed or would prefer to lie down (see picture 1). This reflects an important change in mindset moving away from the need for beds.

As AEC activity can legitimately span inpatient, outpatient and ward attendance it is important to have a tactical approach to coding this activity.

The following steps will help to ensure that you have the information you need to demonstrate impact and requirements for commissioners.

– Identify any AEC activity separately from other emergency activity locally so that providers and commissioners can see the impact on emergency patient flow.

– Define AEC activity based on the intention for same day emergency care irrespective of whether or not a bed is involved.

– Ideally there should be a local agreement with commissioners about tariff, using the Payment by Results Best Practice Tariff as a guide.

– All AEC activity should have clinical coding performed so that major diagnostic groups can be identified and comparisons made with the pre-AEC position. This can be achieved by using the same approach to coding as 'inpatient' to access coding teams. Activity should be excluded from inpatient dataset returns and differentiated from zero stay inpatients where the intended management was not to see and treat on the same day i.e. it was not planned, it just happened that way.

Picture 1.

2.

What is measurement for improvement?

The three reasons for measurement

There are three main reasons why we measure:

research, judgement and improvement.

Understanding what you are measuring and why, is vital as it determines how you approach the measurement process.

Figure 4:
Three different approaches to measurement and the impact on measurement processes.

Characteristic	Judgement	Research	Improvement
Aim	Achievement of target	New Knowledge	Improvement of service
Testing Strategy	No tests	One large test Test blinded	Sequential tests Tests observable
Hypothesis	No hypothesis	Fixed hypothesis	Hypothesis flexible, changes as learning takes place
Variation	Adjust measures to reduce variation	Design to eliminate unwanted variation	Accept consistent variation
Determining if change is an improvement	No change focus	Statistical tests (t-test, F-test, chi square, p values)	Run charts or statistical process control (SPC) charts

[Adapted from: The Three Faces of Performance Measurement: Improvement, Accountability and Research." Solberg, Leif I., Mosser, Gordon and McDonald, Susan Journal on Quality Improvement. March 1997, Vol.23, No. 3.]

Clinical staff are often more familiar with measurement for research whereas service managers and those in more strategic roles may be more familiar with measurement for judgement as a way of understanding performance.

Measuring for improvement is different. The concept of sequential testing means that there needs to be a willingness to frequently change the hypothesis (as you learn more with each test) and an acceptance of working with 'just enough' data - i.e. using data and information that is 'good enough' rather than perfect.

Measurement for improvement does not seek to prove or disprove whether clinical interventions work – it seeks to answer the question:

"how do we make it work here?"

For example, some teams in the AEC Delivery Network started testing how AEC could be provided before a specific AEC unit was established. This provided them with learning and information which in turn helped to: develop business cases, make revisions to patient pathways and protocols, develop systems of care and, inform measurement plans, in advance of their AEC unit being fully developed. They did this by conducting initial small scale pilots on special "AEC chairs" or "designated trolleys" within existing emergency care clinical areas.

It is important to note that the teams were not researching the concept of AEC, but learning how it would work best within their local environment and context.

One of the key things that has become clear through the AEC Delivery Network, is that trying to implement AEC in a small scale, condition by condition approach is unlikely to deliver change at a large enough scale to demonstrate impact.   Those teams that have been most successful have taken on AEC as an approach, an change in 'mindset' so moved progressed from a pathway by pathway approach, to setting it up as the default pathway for patients for whom it is appropriate. Therefore on screening patients are assumed to be AEC, unless on assessment it is demonstrated that they need an overnight stay.

The different types of measures

When looking to improve or develop services, there are three types of measures that need to be considered: outcome, process and balancing measures. It can be helpful when you have selected what you consider to be an appropriate range of measures, to check what type of measures they are. Are they telling you something about what happened to the patient (outcome measure), or are they telling you something about the process of care (process measure)? Knowing that you have only selected measures of one type might mean that you need to revise your selections.

Outcome measures reflect the impact on the patient and show the end result of your improvement work; for example the number of patients receiving same day emergency care who would otherwise have been admitted.

Process measures reflect the way your systems and processes work to deliver the outcome you want. For example, the length of time a patient waits for a senior review or the number of daily ward rounds that take place per week in the emergency department.

Balancing measures reflect what may be happening elsewhere in the system as a result of the change. This impact may be positive or negative, for example your unplanned readmission rate. If this has increased then you might want to question whether, on balance, you are right to continue with the changes or not. Listening to any sceptics can sometimes alert us to relevant balancing measures. When presented with change, people can be heard to say things like "if you change this, it will affect that." Picking up on the 'that' can lead to a useful balancing measure.

Other considerations are the organisation's strategic objectives and linking this via balancing measures: for example demonstrating return on investment or productivity gains.

All three types of measures are important. The reason why we have a focus on process measures as well as outcome measures is because reliable processes are a proven way to improve outcomes. So we need to improve our processes first to make them extremely reliable and then improved outcomes will follow.

Good measures are linked to your aim – they reflect how the aim is achieved

Driver diagrams: understanding and measuring what may impact the outcome

Driver diagrams are a practical tool that help answer the question, "how do we make it work here?" by providing a "theory of change" for achieving the overall goal. They provide a structured logic of the important factors that affect the overall goal and key actions that impact those factors.

This is done by means of a structured logic chart with three or more levels that include:

1. A goal or vision.

2. The high-level factors that you need to influence in order to achieve this goal (called 'primary drivers').

3. Specific projects and activities that would act upon these factors to help to achieve the goal (interventions).

For more complex goals the number of levels in a driver diagram can be expanded so that each primary driver has its own set of underpinning factors (i.e. 'secondary drivers' etc.). It is these secondary drivers (or lower level drivers) that would then be linked to projects and activities.

A good driver diagram highlights your theory of change and helps to highlight what is important for you to measure. Through this you can select appropriate outcome, process and balancing measures.

Members of the AEC Delivery Network used driver diagrams in two ways:

1. Where the development of AEC services was considered to be a primary or secondary driver to contribute to another bigger aim. This allows teams to see the context and interaction of AEC services with other primary drivers (Figure 5).

2. Where the focus was on the development of AEC services. This provides a clear focus for the project team on both external and internal drivers to their project, where external drivers are those drivers outside the control of the project team (Figure 6).

Figure 5:
Illustration of where AEC is a key strategic secondary driver to achieve another outcome.

Aim	Primary Driver	Intervention
To ensure emergency patients receive right care, right place at the right time.	'Stream emergency patients' based on whether they require an overnight stay.	Establish AEC services and redesign emergency patient flow.
		Rapid access to senior decision makers / diagnostics in ED.
	Prevent patients who do not need to be admitted from attending ED.	Urgent care clinic for GPs to refer into.
		Community rapid response eg community matrons, nurses.
		Ambulance service 111 services enables communication.
	Ensure timely discharge for those admitted to hospital.	Reduce delays to discharges through using estimated data of discharge etc.
		Reduce delays in diagnostics and decision making on treatment plans.

Figure 6:
Example of an AEC driver diagram in Weston General Hospital linked with different types of measures.

Aim	Primary Driver	Intervention

02

Ensure the right patients are identified.

Analyse activity daily.

Ensure staff are trained in AEC.

Undertake board rounds in ED. **P2**

01 / B

To prevent ambulatory patients being admitted to hospital overnight.

Reduce avoidable late presentations.

Advertise AEC stream.

Create next day urgent slots.

P1

Avoid delays / diagnostics / decisions.

Rapid access to diagnostics.

Immediate access to senior clinician. **P3**

Smooth discharge.

Easy access to take home meds.

Outcome measure
01: Overall admission count
02: Overall unnecessary admissions

Process Measure
P1: Delays in diagnosis / treatment
P2: Number of board rounds in ED
P3: Time to access senior clinician

Patient Experience / Outcome
B1: Clinical Outcome / incidence
B2: Patient experience
B3: Bed days released

Ratio and percentages

Having decided what you need to measure, you now need to decide how it should be expressed. Do you want to express it as a percentage of patients seen or the rate per 1,000 patients or simply as a count?

Which option should you use?

Use Counts when the target population does not change very much or your focus for change is to increase the target population e.g. number of patients who receive same day emergency care. It has the advantage of simplicity but it can be difficult to compare with others or even with yourself over time.

Use Ratios or rates when you want to relate your measure to some other factor such as patients or bed days. An example of a ratio is the number of incidents per patient or per bed day. In this illustration (Figure 7) the numerator (the number on the top of the equation) is 2 incidents and the denominator (the number on the bottom of the equation) is 400 patients giving a ratio of 0.005 incidents per patient.

A rate is the ratio times by a multiplier of the denominator. It is often used to make it easier to interpret small ratios. In the illustration (Figure 7) the multiplier is 1,000 so a ratio of 0.005 becomes 5 incidents per 1,000 patients.

Figure 7:
Illustration of ratios and rates in AEC.

Example: the AEC unit identified 2 incidents in 400 patients who received AEC services. The final calculation depends upon if you are calculating a rate or ratio.

Ratio 0.005 incidents per patient.

$$\frac{2}{400}$$

2 ← Numerator

400 ← Denominator

[Rate is 5 incidents per 1,000 patients is the ratio multiplied by 1,000].

Use Percentages when what you are measuring is a sub-set of a population. In mathematical terms, this means that the numerator and denominator (see above for description of these words) are in the same units. In the example above we would count the number of patients who had a clinical incident divided by all patients. Notice that we have moved away from counting clinical incidents to counting patients who had an incident to allow us to frame the measure as a percentage.
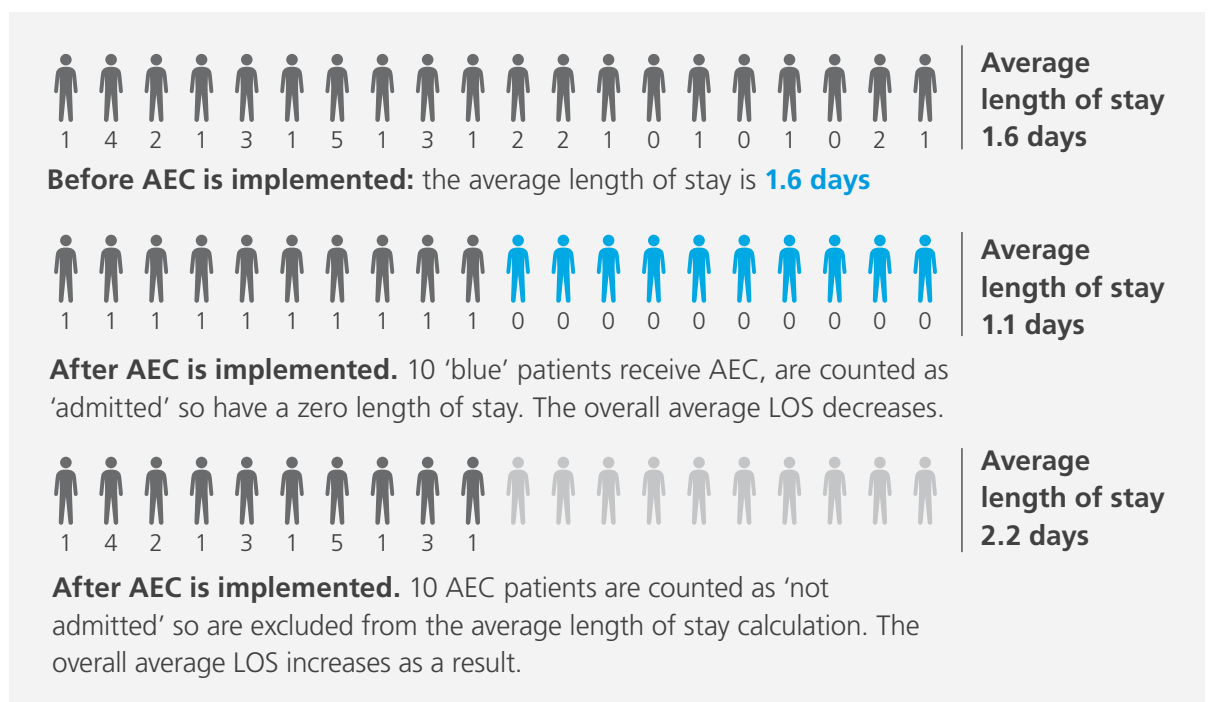
Use Time between or cases between when you are tracking a 'rare' event, say one that occurs less than once a week on average. If a clinical incident occurs this infrequently, then measures expressed as rates or percentages become less useful. A count of monthly clinical incidents might look something like: 2,3,3,3,2,3,4,3,3,2,2,4.

A change of 1 incident is quite a percentage shift and therefore our chart would vary wildly but based only on 1 more or less incident. Clearly this is not very helpful. In this case express the measure as the number of cases since the last incident. We might now get values such as 75, 57, 82, 34 cases between incidents. When charted this gives us something more useful to look at, and it is not affected by the 'small number' problem that bedevils rates and percentages.

Average length of stay and the impact of changing populations

A manager commented in a meeting: "why is our average length of stay increasing yet we are providing more and more AEC care, and we are avoiding hospital admissions?"

Figure 8 explains why this is the case.

Average length of stay **1.6 days**

1 4 2 1 3 1 5 1 3 1 2 2 1 0 1 0 1 0 2 1

Before AEC is implemented: the average length of stay is **1.6 days**

Average length of stay 1.1 days

1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0

After AEC is implemented. 10 'blue' patients receive AEC, are counted as 'admitted' so have a zero length of stay. The overall average LOS decreases.

Average length of stay 2.2 days

1 4 2 1 3 1 5 1 3 1

After AEC is implemented. 10 AEC patients are counted as 'not admitted' so are excluded from the average length of stay calculation. The overall average LOS increases as a result.

Regardless of the way this is counted, the total 'whole' bed-days used would be 22 less days after the implementation of AEC.

This illustration describes a useful principle to be aware of as other measures can be affected by separating the AEC patients from the emergency patients as the case mix of AEC patients is different.

3.

How do I measure for improvement?
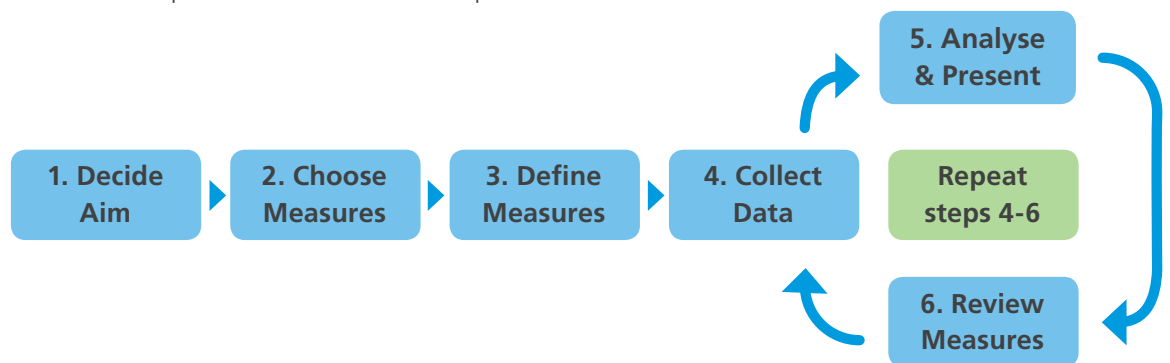
How do I measure for improvement?

Measurement doesn't just happen by itself. It needs careful planning and refinement throughout the course of any project. The seven steps to measurement for improvement provide a structure for this:

1. Decide your aim

2. Choose your measures

3. Define your measures and confirm how you will collect them

4. Collect your baseline data

5. Analyse and present your data

6. Meet to decide what your data is telling you

7. Repeat steps 4 to 6

The combined approach to being able to demonstrate whether or not AEC has made a difference, with further information on income, costs and other benefits provides all the information necessary to establish a complete picture for understanding the Return on Investment.

Figure 9:
The seven steps in measurement for improvement.

Top tips

Key things to remember when starting to measure:

– Seek usefulness not perfection – measurement should be used to focus and speed improvement up, not to slow things down.

– Measure the minimum. Only collect what you need; there may be other information out there but the aim is to keep things as simple as possible.

– Remember the goal is improvement and not a new measurement system. It's easy to get sidetracked into improving data quality, especially if you are confronted with challenges on the credibility of the data – just ensure it's 'good enough'.

Aim to make measurement part of the daily routine. Where possible use forms or charts that are already in use. This minimises the burden on staff and also maximises the chances of it being done reliably and sustainably.

Steps 1 to 3 – Getting yourself ready

Step 1 – Decide your aim

The key points to remember about aim setting are:

– those involved in making the changes should be able to relate the project work to their organisation's strategic goals.

– the aim statement should be SMART:
Specific – **M**easureable – **A**chievable – **R**elevant – **T**ime-bound

– make it patient focussed, describe how your change will improve the service for patients.

Below are examples of strategic goals identified by organisations involved in the AEC Delivery Network that AEC could contribute towards achieving.

Figure 10:

Examples of different organisations' strategic goals relevant to AEC
Improve patient experience
Improve emergency (unplanned) patient flow
Achieving the 4 hour emergency access target
Release bed capacity by preventing unnecessary emergency admissions
Providing safer care and reducing the risk of harm (falls, pressure ulcers) Improving the staff experience
Providing more efficient care by reducing the resources each patient needs without compromising patient outcomes
Providing "better, cheaper, faster care"
Achieving QIPP targets

Source: York Health Economic Centre's study of AEC, NHS Institute analysis 2012.

The consistent and underpinning aim for AEC services across the AEC Network has been:

"To increase the numbers and proportion of emergency patients who receive same day emergency care"

Individual network members made this aim 'SMART' by setting out clearly the expected number of patients in specific timescales.

Although this was a consistent theme, each team used its own wording and emphasis. An aim statement should help to communicate the aims of a project (or new service development) so that staff and patients are able to understand it easily. A number of hospitals also included the patient experience in their aim statement, for example:

"and improve patients' experience of same day emergency care"

"Establishing a new AEC service is not an aim, it is the means by which to achieve an aim, which has to be about making things better for patients or customers".

Mike Davidge, Head of Measurement , NHS III

A test of a good aim statement: If you were in a lift could you clearly and briefly describe your aim in a sentence – i.e. the time it takes to travel from one floor to the next?

Step 2 – Choose your measures

There are a huge range of potential measures in any project and Step 2 will help you to select the right ones. Appendix 2 lists all the measures identified through the AEC Delivery Network.

The starting point is:

– make sure that you measure your aim

– a few good measures are better than lots of "just in case measures".

With additional data collection (see Appendix 3) it is possible to calculate the potential return on investment of your proposed service. In order to calculate this, you will need to demonstrate the impact on services. The core measurement questions for AEC services are:

– who are the patients?

– how effective is the decision making along emergency care pathways?

– how effective is the service?

Who are the patients?

**How do they currently receive hospital services in an emergency?
How could they receive services in an emergency in the future?**

We need to know which patients are actually using AEC services not just the total activity. The changes in emergency flow are important to record, so the key measures are:

– Number of emergency patients by day by diagnostic group.

– Percentage of these patients who are being managed by AEC.

How effective is the decision making?

We need to know whether the right patients are going down the right pathways. Some possible process measures include:

– percentage of patients using AEC within diagnostic groups that should be using it (the Directory of Ambulatory Emergency care can be used as a basis for this - reference is Appendix 5). This tells us whether we are getting the target group into the AEC service

– percentage of AEC activity that is not in the target diagnostic groups. This tells us if there is unanticipated demand. This will tell us how good our predictions of the target groups have been

– the number of handovers before treatment or decision not to treat gives an indication of the efficiency of the pathway.

At the Whittington Hospital as part of their local measurement plan, medics recorded the following for each patient:

– Did the service prevent an admission?

– Did the service speed up discharge, if the patient was admitted?

This forms part of a plan to assess the immediate impact of the service. The project team knew that indicators such as these would be useful indicative measures for about 6 months, whilst the service became established.

How effective is the service (outcome and balancing)?

We need to know that we have achieved some benefits for patients and staff and avoided adverse unintended consequences. This requires a range of outcome, process and balancing measures. Some suggestions for measures are as follows:

– Clinical outcomes and clinical incidence.

– Patient experience, either quantitative or qualitative using methods such as Experience Based Design.

"Like all areas of hospital care, AEC services would benefit from monitoring mortality within 28 days of treatment as routine, alongside other outcome measures".

Professor
Matthew Cooke

– Unplanned/emergency readmissions or re-attendances within 30 days.

– Reduction in unplanned/emergency bed utilisation.

– Impact on other measures of emergency flow such as waiting times in the emergency department or surgical and medical outliers.

Understanding how patients experience your service is an important measure to capture. Here are some comments from patients about AEC services in some of the organisations taking part in the AEC Delivery network.

Figure 11:
Patients comments on the experience of AEC service.

I can have my own home comforts... and sleep

Much better so that I can continue to stay at home and do work... time is money

I don't like staying in hospital as I have 3 children and they need looking after

If it's faster then I would be happy

I would have preferred this option as I could have got home for the cats

It would be a good idea to give the bed up for someone who needs it.
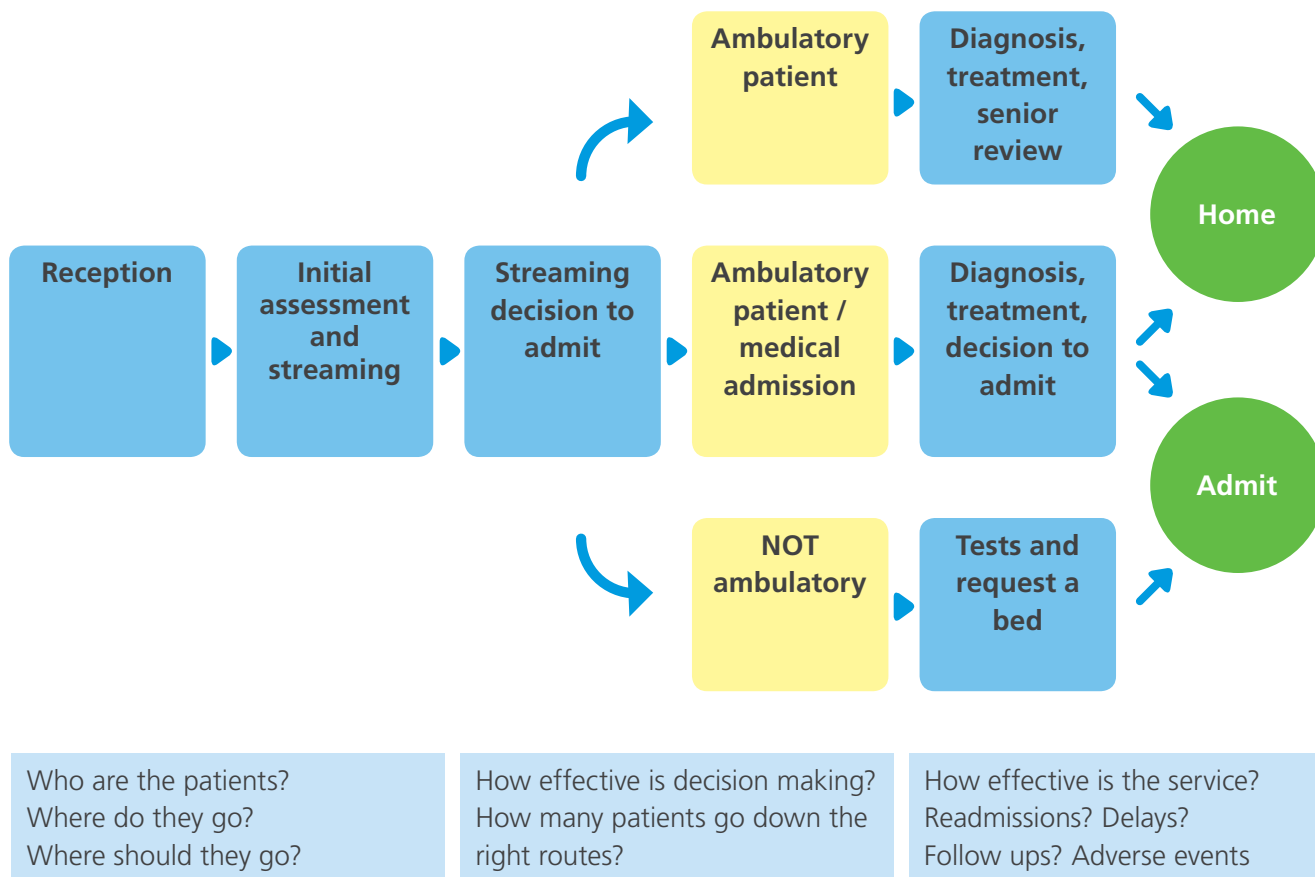
Tools that help to identify important measures

In addition to the three core questions above , the two tools that can help you to select measures are:

– Process mapping.

– Driver diagrams (previously described in section 2).

Weston Healthcare Trust's driver diagram (on page 17) shows how the hospital identified key measures. The example on the next page (Figure 12) from Nottingham Healthcare Trust's high level process map and how they are approaching measurement in practice.

Figure 12:
Linking a process chart to planning measures, Nottingham Healthcare Trust.

Who are the patients? Where do they go? Where should they go?	How effective is decision making? How many patients go down the right routes?	How effective is the service? Readmissions? Delays? Follow ups? Adverse events

The team monitored a range of measures weekly including: how many patients are seen on the ambulatory pathway, how long patients stayed in the AEC service, the proportion of GP patients who were converted to ambulatory care, and how many non-AEC patients had a length of stay of less than 12 hours.

"Every week we check how well our process is working to see where additional improvement can be made."

AEC Team
Nottingham
Healthcare Trust

Step 3 – Define measures

Use the measurement template (Appendix 4) to help you to work through this step.

You will need to identify the data required and where it will come from. Sometimes data will already be collected, but often you will need to obtain the data yourself. The process of working this out helps you to define exactly what it is you are measuring but sometimes you will find that it is so complex that you need to rethink what the best measure is, to ensure that the data is collected reliably.

Operational definitions

Measures require an operational definition, which is a description, in quantifiable terms, of what to measure and the steps to follow to be able to measure it consistently. It needs to be practical and meaningful for anyone involved in collecting data and interpreting the measures used. In essence:

Are we measuring the same thing?

Make sure that your measure is well defined and has clear instructions that can be easily followed and repeated both by yourself at a later date and by others.

– **Repeatability:** Can you, the person who created the definition, understand it and repeat it?

– **Reproducibility**: After repeatability, try seeing if the definition that you have created can be reproduced by other individuals.

As you set up your service, use national guidelines and local discussion with commissioners to ensure there is common agreement about the definition of AEC for your service and patients.

"The one overriding problem with data definitions in the NHS is the classification of patients that stay in hospital for a short period of time – usually less than 24 hours."

Audit Commission, 2012

Example of an operational definition: using the template in Appendix 4

Measure Name
Length of stay in AEC unit.

Why is it important?
(Link back to driver diagram)

It is a way of determining 'turn-around' times i.e. time to be seen by a senior decision maker, time to have and get the interpreted results from diagnostic tests and finally an ultimate decision on whether to discharge, admit/transfer or discharge with a follow-up appointment.

Measure definition

What is the definition?
(Spell it out very clearly in words)

How long patients stay in the AEC unit from the time they arrive to the time that they depart to the nearest hour.

What data items do you need?

The date/time that the patient arrives in the unit (using the 24 hour clock and to the nearest hour).

The date/time that the patient is departs the unit (using the 24 hour clock and to the nearest hour).

What is the calculation?

The date/time the patient departs the unit minus the date/time the patient arrives in the unit in hours.

Which patient groups are to be covered?
Do you need to stratify? (For example, are there differences by shift, time of day, day of week, severity etc)

All patients that attend the AEC unit to be included in the calculation.

A local solution to a common problem: outpatient data giving insufficient information at a patient level

South Tyneside NHS Foundation Trust and its commissioners decided that they wanted all AEC activity to be collected in the same way as inpatient activity. Ceri Bentham, their business manager explained: "we decided that we wanted the activity to be coded as if this was inpatient activity, but from a commissioners perspective paid as AEC via a local tariff arrangement. This means that we can analyse activity by HRG, and get a report of unplanned re-admission to AEC or to the hospital within 7 and 30 days through the Trust's existing systems. We then exclude this activity from the national inpatient returns to ensure that payment only occurs via the local tariff arrangements."

This is a good example of a sustainable and practical solution for data collection in AEC.

Steps 4 to 6 – The Collect-Analyse-Review measurement cycle

Measurement itself is a process. In its simplest form it consists of three stages. First you collect some data, then you analyse it and present in an appropriate way to convert it into useful information, and finally you review your information to see what decisions you need to make. The Collect-Analyse-Review cycle then starts all over again.

Step 4 – Collect your baseline data

You will need to know your baseline before you can track the progress in trying to reach your goal. To create a baseline that is plotted on a run chart (for more information see below), about 25 data points are ideal but 20 data points will provide a fairly robust representation of the current situation. One way to get more points is to measure more frequently i.e. weekly or daily, or consider how you could measure patient by patient.

When considering AEC, your baseline data should be based on your pre-AEC emergency patient flow.

Step 5 – Analyse and present

In order to be able to demonstrate whether a specific intervention has made an impact, it is essential to plot the measure over time and annotate when changes were introduced against a baseline. If AEC has made an impact on emergency flow, then you would expect this to be demonstrated in the flow of patients through the emergency care system. The size of the impact will be related to the number of patients receiving same day emergency care.

There are two methods to support the robust interpretation of measures presented over time:

– **Run charts** – a simple line chart also showing the average (median) line with statistical rules to interpret 'runs'.

– **Statistical Process Control Charts (SPC) charts** – you generally need either a statistical or specialist software package to develop these - in addition to the average line (mean or median) there are two control lines above and below the average line that allows more statistical interpretation (See Appendix 5).

Figure 13 provides an example of a run chart illustrating the percentage of medicines reconciled on a medical admissions unit. It shows the benefits of annotating charts to see the impact (or not) of change. For more information on run charts go to Section 4.
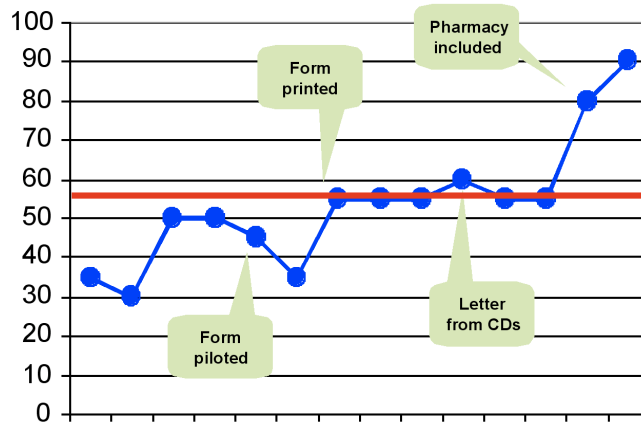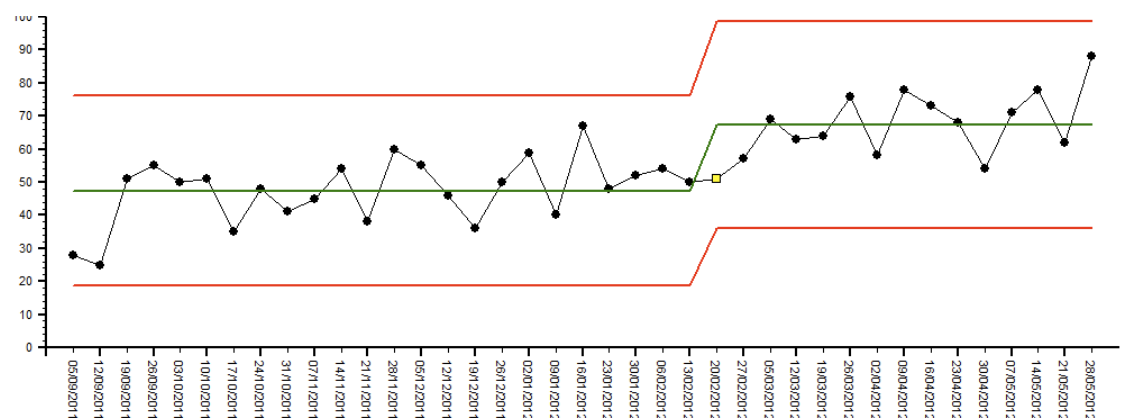

Figure 13:
Run chart of the percentage of medicine reconciled on a medical admissions unit.

Figure 14 is an example of an SPC chart. The statistical process control chart (SPC) is a further refinement of a run chart. It introduces the idea of expected variation, that is, how much variation a process typically exhibits.

This chart describes the process before and after change. A 'break' in the chart has been made as a result of using SPC rules the identified a statistical signal of change and the knowledge of the changes that have been made.

Figure 14:
An example of an Statistical Process Control chart showing a step change.

Using these methods for presenting your data is robust, as they support the interpretation of data and provide a solid basis for decision making. It is important to use the statistical rules that are used alongside run charts and SPC charts as without the rules, it is easy to misinterpret the data. Section 4 describes the rules to interpret both run and SPC charts.

Step 6 – Review your data to understand what it is telling you

We live in a world filled with variation - and yet there is very little recognition or understanding of variation.

William Scherkenbach

Data should always be preserved in a way that preserves the evidence in the data.
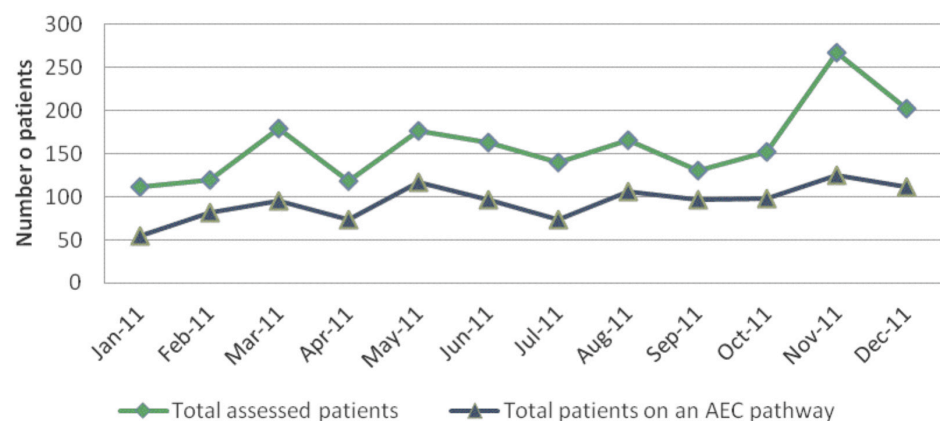
Walter Shewhart

It is vital that you set aside time to look at what your measures are telling you about your process and any impact changes that your processes may (or may not) have made.

The following example (Figure 15) is a line run chart of one team's approach to review activity following the establishment of their AEC unit. The team started off monitoring two things: total number of patients "assessed" and total number of patients who were on an AEC pathway on a monthly basis.

Over time the team asked and answered a number of questions. They started off focusing on "why is there a gap between the total number of assessed patients and the total number of patients on an AEC pathway?". Their first hunch was that the gap was due to follow-up appointments being included in the "total number of assessed patients". They collected three months of data to answer this question and found out that although the majority of patients were either on an AEC pathway or a follow-up, that some patients were neither. The next question "who are these patients and what is their pathway?"

With more data, the team realised these patients were being assessed in their AEC unit but ended up being admitted to hospital. This represented 17% of all their new activity and as a result became a new focus for improvement in their hospital.

Figure 15:
Activity in an AEC Unit.

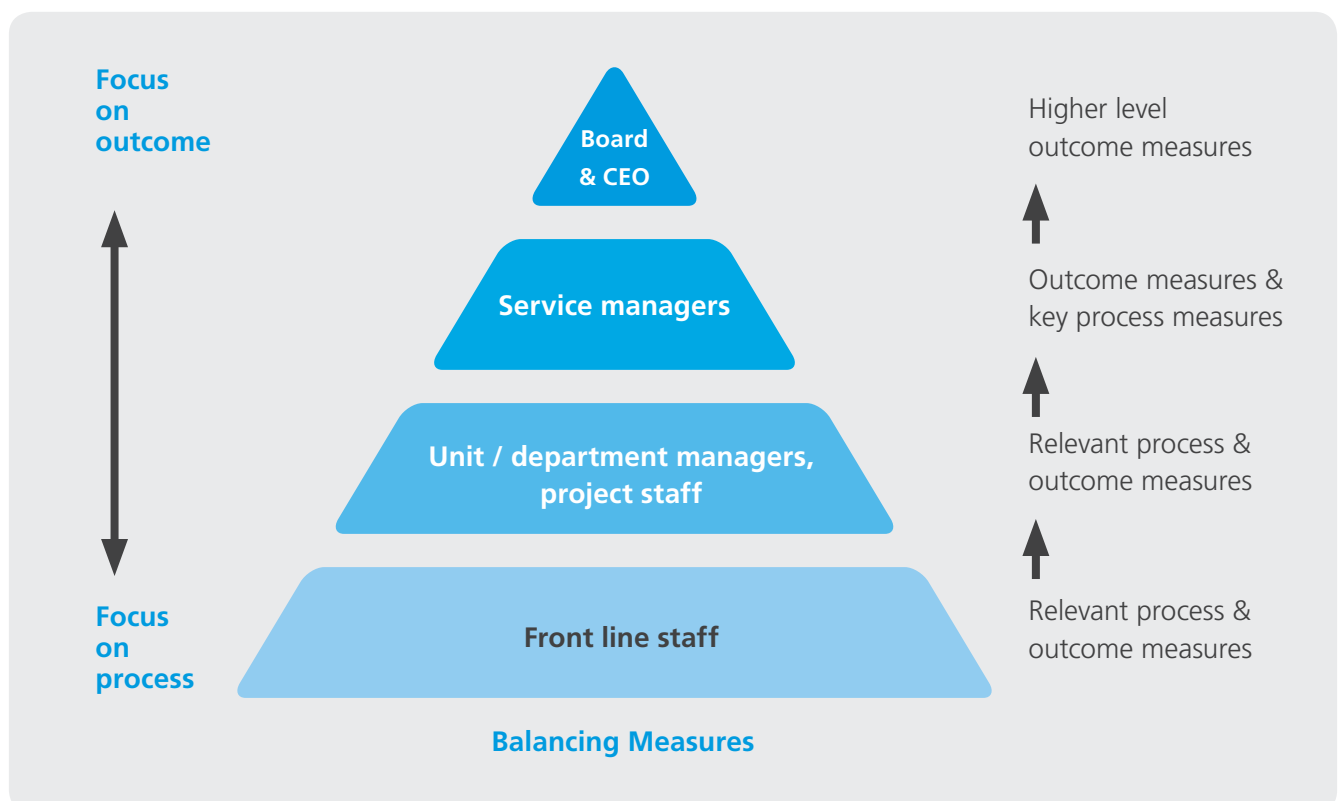**Who needs to know what the data is telling you?**

The key aim is to ensure that each layer of staff only receive the information they need to assure them that changes are progressing in the right direction (Figure 16). The board typically focuses on strategic outcome measures eg number of bed days released. Teams would only need to report balancing and intermediate process measures if there is a stall in progress suggesting there is a problem that requires the Board's attention or decision.

"It is a waste of time collecting and analysing your data if you don't take action on the results."

Front line teams will have a focus on real-time feedback on the effectiveness of the service and decision making along emergency care and AEC pathways and through this would review outcome measures. Within the AEC network, we encouraged information analysts to work closely with clinical and managerial colleagues as an integral part of the team.

For example a Board would be interested in the overall impact of AEC service, and this should reflect AECs contribution to the hospital's strategic goals: for example total number of patients receiving AEC services, patient experience, number of bed days released and financial measures. The team would be need to have measures that give them instant feedback on the effectiveness of decision making and the service. For example the number of patients who are admitted to hospital via the AEC unit.

Figure 16:
The hierarchy of measurement reporting.

Focus on outcome

Board & CEO

Higher level outcome measures

Service managers

Outcome measures & key process measures

Unit / department managers, project staff

Relevant process & outcome measures

Front line staff

Relevant process & outcome measures

Focus on process

Balancing Measures

Step 7 – Keep going!

When do I stop measuring? The simple answer is "you don't".

The final step focuses on continuous improvement. Repeat steps 4, 5 and 6 frequently as you start up your AEC service and continue this throughout the development and ongoing operational management.

From a measurement perspective, some measures may evolve or change over time as you move from setting up and establishing a service to routine monitoring, operational management and continuous improvement.

4.

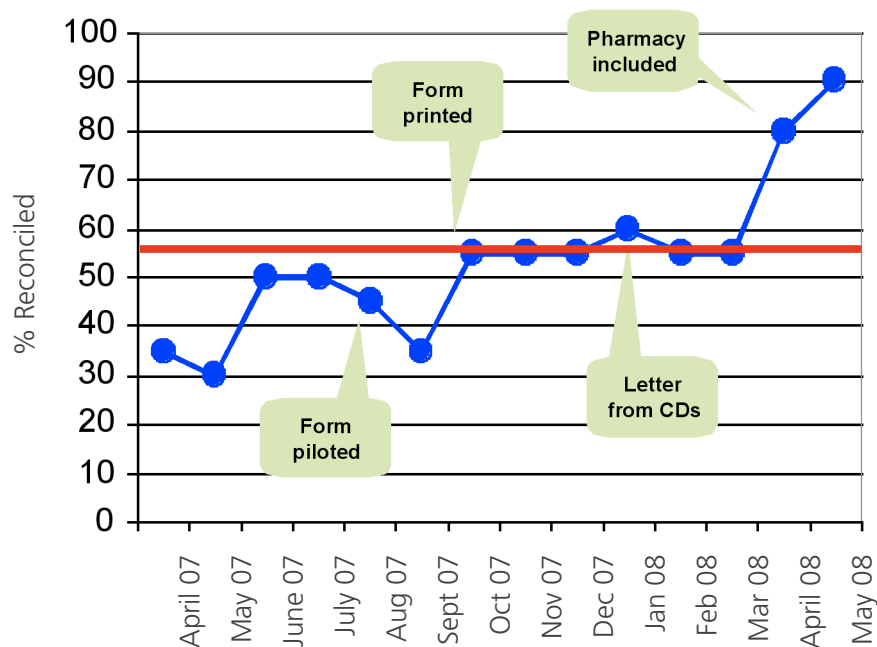# Further information on run charts and statistical process control charts

More information about run charts

Run charts are simple to construct and provide an effective way to determine whether the changes you are making are leading to improvements. A run chart is a line chart of your measure over time, with the average (median) line also being shown. It can be constructed easily on graph paper or using a spreadsheet package such as Microsoft Excel.

Figure 17 is an example of a run chart of the percentage of medicines reconciled on a medical admissions unit. It has also been annotated with the dates that specific changes were introduced.

Figure 17:
Run chart of medicine reconciliation.

What is this telling us?

In the first few months, the percentage reconciled varied between 30% and 50%. Once a new form was introduced in October 2007, performance rose slightly and seemed to stabilise at 55%. The letter from the Clinical Director does not seem to have had much effect whereas the introduction of pharmacy had a more obvious one. It is too early to tell whether the improvement is permanent, we would need several more months showing 90% before we could be confident about that. Nevertheless the run chart shows clearly which interventions had an impact and which ones didn't. This is important to know. We don't want to be spending time and energy pursuing something that is not helping us.

How do I know whether changes are an improvement?

There are four rules that you can apply to run charts to help you identify what's happening after you've made a change and therefore determine whether it is really an improvement. These are based on the median middle line and the concept of a 'run'.

The median is simply the middle value of all your values if they were arranged in order. A 'run' is a consecutive series of points that are above the median or below it. Any points on the median are ignored.

Rule 1: 7 or more consecutive points above or below the median. These runs indicate a shift in the process. Values are still varying but they are doing so around a new median value. If this is a shift in the right direction, it is likely that the change you made is having a beneficial effect.

In the complaints chart (Figure 18) rule 1 has been broken as there are 7 consecutive points below the median from July 2011 to January 2012.

Rule 2: 7 or more consecutive points all increasing or decreasing. This indicates a trend and suggests that the change you made is having an effect but you don't know yet where performance will become stable again. You need to keep measuring to find out. This situation is more likely to occur if you are rolling out a change over a period of time. These points can cross the median line.

Rule 3: Too many or too few runs. You need to circle the runs as shown in the chart (Figure 18) about complaints and then count them up. Note that any points that fall on the median line should be ignored.

Calculate the number of "useful observations" by subtracting the number of data points on the median from the total number of data points. Then find this number in Column 1 of the table 1.

If the number of runs in your data falls below the lower limit or above the upper limit, then this is different from what we might expect by chance. If the number falls outside the range then some external factor is having an effect. Too many runs suggest the process has become less consistent and it is possible that your change has had a detrimental effect. Too few runs suggest a more consistent process which may demonstrate improvement.

In the complaints run chart we have 8 runs as indicated by the circles and 23 useful data points (2 points are on the median). Looking at the table we can see that - the lower limit for 23 useful data points is 8 and the upper limit is 16. Therefore this rule has not yet been broken.

Rule 4: An 'astronomical' data point. You should use your own judgement to assess whether the result in question really is 'odd'. Often such markedly out of range results are caused by a data collection or data definition problem so check that first. If the data seems ok then try to find out what might have caused such an odd result. It may cause you to think about creating a contingency plan for if such an occasion arose again.

Figure 18:
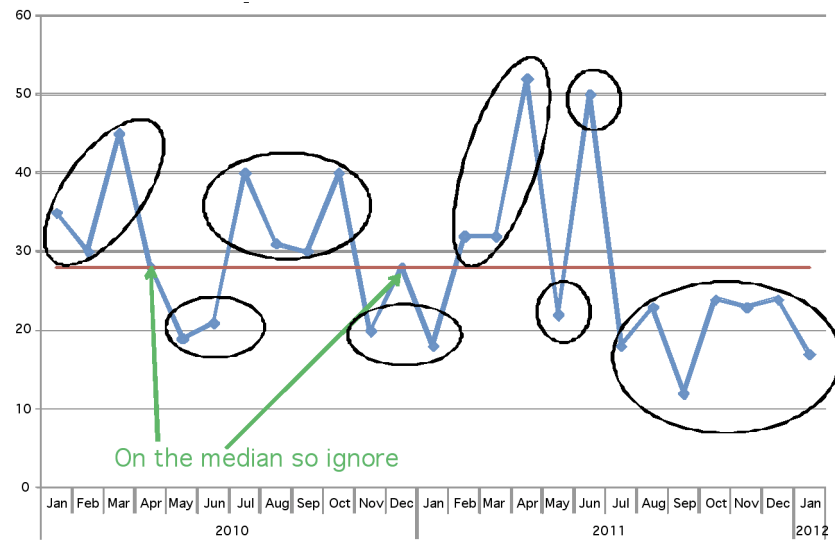Run chart of total number of complaints.

<u>Table 1:</u>
Expected number of runs.

Rules for number of runs above and below the median.

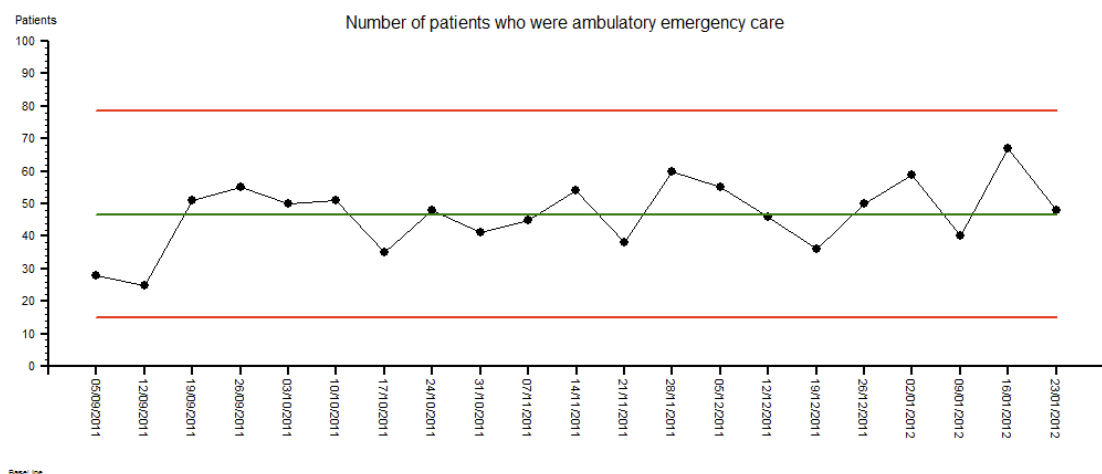| Number of Data Points	Lower Limit for Number of Runs	Upper Limit for Number of Runs
10	3	8
11	3	9
12	3	10
13	4	10
14	4	11
15	4	12
16	5	12
17	5	13
18	6	13
19	6	14
20	6	15
21	7	15
22	7	16
23	8	16
24	8	17
25	9	17
26	9	18
27	9	19
28	10	19
29	10	20
30	11	20
31	11	21
32	11	22
33	11	22
34	12	23
35	13	23
36	13	24
37	13	25
38	14	25
39	14	26
40	15	26

What is the difference between run charts and statistical process control charts?

The statistical process control chart (SPC) chart is a further refinement of a run chart. It introduces the idea of expected variation, that is, how much variation a process typically exhibits. This is due to the upper and lower process control limits the two lines above and below the mean or median.

If our process exhibits just random variation, we can use the SPC chart to 'predict' what future performance would be like. We would expect any future data points to vary around the average and lie within an 'upper control limit' and a 'lower control limit'. In the chart below (Figure 19a) we can predict that the future activity will reliably be between 15 and 75 patients per week. This process would be described as being in control, i.e. it simply demonstrates usual random variation. (or 'common cause') and is therefore predictable.

Figure 19a:
SPC chart of a stable and therefore predictable.

SPC has many rules but the basic ones are similar to run chart rules.

Rule 1 - Any point outside one of the control limits - similar to an 'astronomical point' in run charts, SPC allows a statistical interpretation rather than just personal judgement.

Rule 2 - A run of seven points all above or all below the centre line, or all increasing or all decreasing which would indicate either a shift in the process or a trend.
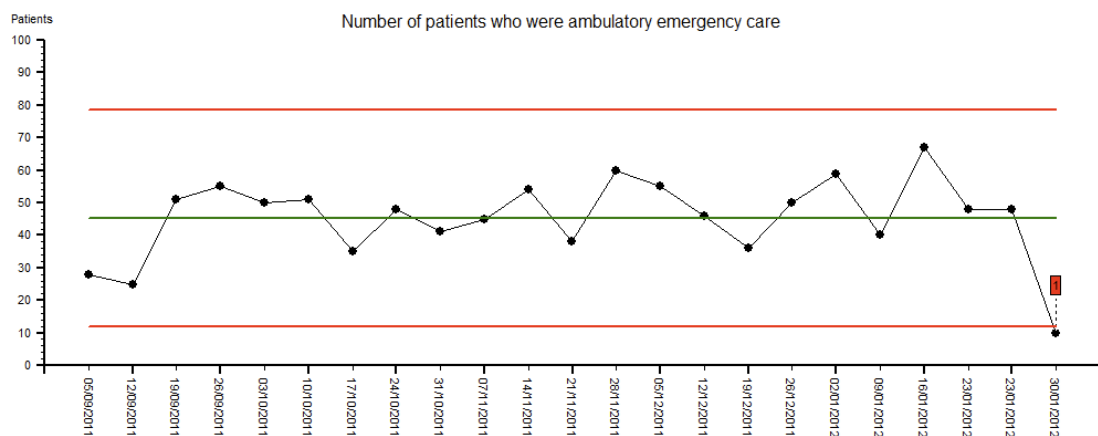
Rule 3 - Any "unusual" pattern or trends within the control limits which will need further investigation to understand the underlying reasons.

Rule 4 - Distribution of the points within a defined zone in the SPC. Less than 2/3 of all the points fall in this zone or more than 2/3 of all the points fall in this zone. The first distribution may indicate that you are in fact monitoring two separate and distinct processes which need to be plotted on two SPC charts. If more than 2/3 of the points fall in this zone may be an indication of process improvement and if this is the case, you can recalculate the control limits.

An example of rule 1 which allows this interpretation is illustrated on the next SPC chart (Figure 19b). In one month only 10 AEC patients were seen. This is what is known as a special cause. An explanation could be something 'out of the ordinary' such as a period of heavy snow making roads impassable for a number of days preventing patients from easily attending the hospital or attending their GP appointments who are the main refers to the AEC service. What is important is that any action you take is appropriate to the special cause, but you may not wish to make any change to the how the services are managed as a result of this special variation.
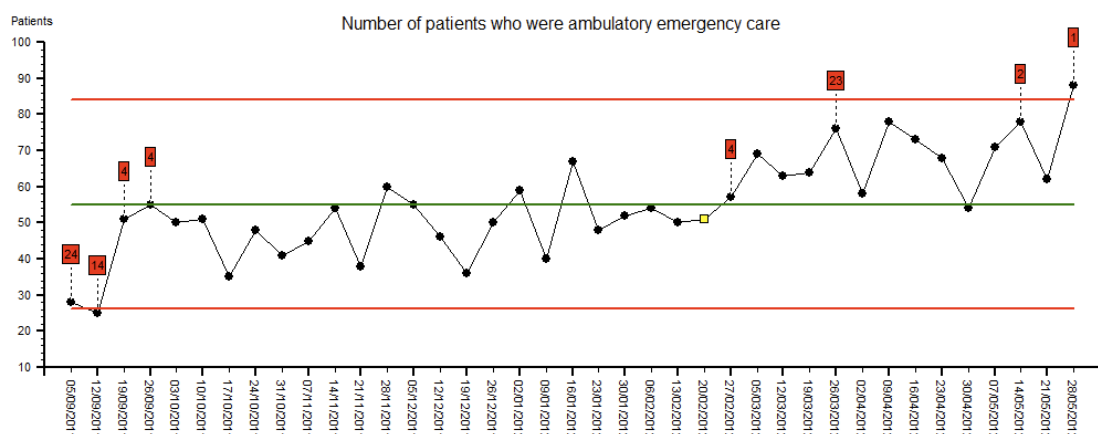
Figure 19b:
An example of rule 1 – a point below the control limits.

The next illustration (Figure 19c) shows a statistical shift (a special cause) that is a result of a planned improvement. The hospital decided that more patients could be treated in an ambulatory way and targeted the emergency department processes. The yellow marker indicates the start of the improvement activity. Both rules 1 and 2 are broken.
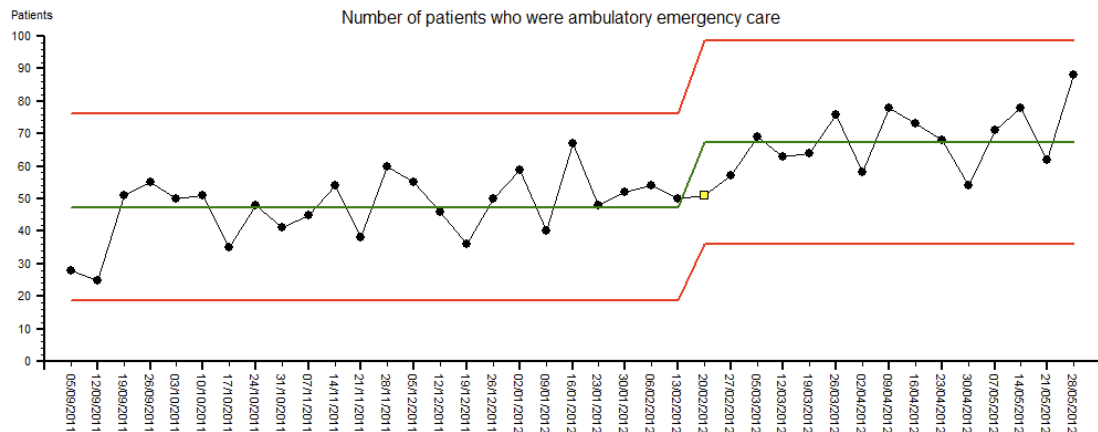
Figure 19c:
A SPC chart demonstrating rules 1 and 2, indicating that a shift in the process.

As we know when the change has occurred both in practice and by looking at the data presented in SPC chart, we have sufficient information to recalculate the control limits around the change as illustrated in the final SPC figure 19d below.

Figure 19d:
A SPC chart demonstrating the increase in number of patients on AEC pathways.

Assessing process capability with SPC charts

You can use the process limits of the SPC chart to help you assess how capable your process is of achieving a particular target.
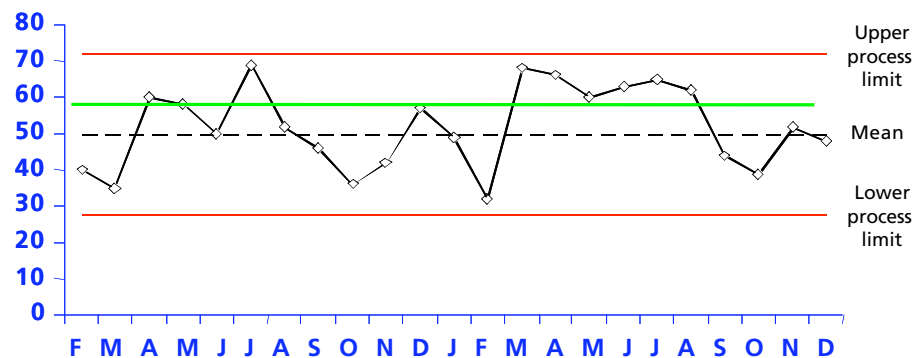
Figure 20:
Process capability.

Figure 20 illustrates this. If we have a target that all AEC patients should be seen by the senior clinical decision maker within 60 minutes of arriving at the unit, then we can monitor if this is happening or not and how capable this process is of achieving the target.

The chart shows that this process is capable of performing at an average of 50 minutes per patients with an expected range of between 28 to 72 minutes. As our target is no more than 60 minutes, some patients do have to wait longer than this standard.

There are two approaches to improving this system to meet our standard. One is to increase our work rate to reduce the average - in practice this often means increasing the time the clinician would have available. The other approach is to work out how to reduce the variation - in practice this focuses on enabling the clinician to be more flexible in their ability to respond within existing resources.

Often improvement strategies are a combination of both approaches. As a rule, it is sensible to start with reducing variation as there are fewer resource implications.

Appendices

1. AEC and national codes

2. List of measures used in AEC Delivery Network

3. Information typically needed for return
   on investment

4. Measurement template checklist

5. References and further information

Appendix 1
National codes relevant for AEC activity

National Codes:

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1   Ordinary admission

A PATIENT not admitted electively, and any PATIENT admitted electively with the expectation that they will remain in hospital for at least one night, including a PATIENT admitted with this intention who leaves hospital for any reason without staying overnight. A PATIENT admitted electively with the intent of not staying overnight, but who does not return home as scheduled, should be counted as an ordinary admission.

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2   Day case admission

A PATIENT admitted electively during the course of a day with the intention of receiving care who does not require the use of a Hospital Bed overnight and who returns home as scheduled. If this original intention is not fulfilled and the PATIENT stays overnight, such a PATIENT should be counted as an ordinary admission.

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3   Regular day admission

A PATIENT admitted electively during the day, as part of a planned series of regular admissions for an on-going regime of broadly similar treatment and who is discharged the same day. If the intention is not fulfilled and one of these admissions should involve a stay of at least 24 hours, such an admission should be classified as an ordinary admission. The series of regular admissions ends when the PATIENT no longer requires frequent admissions.

---

4   Regular night admission

A PATIENT admitted electively for the night, as part of a planned series of regular admissions for an on-going regime of broadly similar treatment and who is discharged in the morning. If the intention is not fulfilled and one of these admissions should involve a stay of at least 24 hours, such an admission should be classified as an ordinary admission. The series of regular admissions ends when the patient no longer requires frequent admissions.

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5   Mother and baby using delivery facilities only

Mother and baby using delivery facilities only and not using a Hospital Bed in the antenatal or postnatal WARDS during the stay in hospital.

Source: NHS Data Dictionary
www.datadictionary.nhs.uk/web_site_content/navigation/main_menu.asp

Appendix 2
List of measures used in AEC Delivery Network

The Patients

% of emergency patients who receive AEC services (ie it was intended they received same day emergency care (and the intention was to provide same day emergency care)

Number of emergency (unplanned) patients, by day, by diagnostic group by length of stay: 0, 1 day, 2+days (or other groupings of length of stay - select where you anticipate making an impact)

Diagnostic / treatment received

Number of patients by day, by diagnostic group who receive Ambulatory Emergency Care

The demand for AEC services

Effective decision making along emergency care pathways

Are the right patients receiving the right emergency care at the right time?

% of emergency patients using AEC within the diagnostic groups that should be using AEC

Patients' referral route pathway: actual numbers against expected numbers or thresholds

% emergency patients that start directly on the right pathway

Patient waiting time in the AEC unit for diagnostics

Number of AEC patients versus the number of follow-ups

% of AEC activity that is not in the target diagnostic group

Proportion patients referred who meet AEC criteria

Number of handovers before treatment or decision not to treat

Patient waiting time in AEC for senior medical clinical overview etc

Temporary measure: clinical view on emergency admission avoidance use up to 6 months post AEC services starting

The effectiveness of AEC care (outcome and balancing)

Outcomes and patient benefits

Clinical outcomes equivalent to pre-AEC care or better

Patient experience of care received e.g. Experience Based Design and feedback via questionnaire or interview

Hospital acquired infections (benefit of avoided hospital admissions)

Unplanned emergency readmissions within 30 days

30 day mortality

Patient waiting time to start treatment

Patient falls (benefit of avoided hospital admissions)

Unplanned emergency re-attendance following AEC within 30 days

Impact on emergency flow and the wider health and social care system

Unplanned / emergency bed utilisation for selected HRGs

Medical (and surgical) outliers (indicator of improvement in patient flow)

Number of community based care packages that need to be restarted

Emergency admission by length of stay: 0, 1 day, 2+days for selected HRGs

Emergency department waiting times

Appendix 3
Information needed for return on investment in AEC

The primary purpose for the return on investment in AEC is to enable commissioners and providers to discuss and jointly plan their expected benefits, including financial benefits. The model that has been developed is based on a simple Return on Investment calculator developed by the NHS Institute and a study carried out by York Health Economics. The model takes into account current English NHS nationally set financial incentives to curb the growth in emergency admissions and reduce emergency readmissions.

Return on investment calculations typically consists of two components:

- Benefits – the benefits and potential dis-benefits of an initiative.

- Costs – one-off (eg capital) and ongoing additional costs of any initiative.

The return on investment model for AEC can be used by organisations to estimate either potential or actual return on investment. The core information requirements include:

- anticipated / actual AEC activity to estimate changes in income and any local tariffs; this requires baseline HRG activity data

- anticipated / actual impact on bed-days released

- anticipated / actual emergency admissions avoided and the 2008 emergency admission cut-off

- other benefits such as reduction in emergency readmission rates

- cost of start-up of the service and ongoing costs (that are in addition to the previous model of care).

Appendix 4
Measurement checklist

Measure name:

Why is it important?
(Link back to driver diagram)

Measure definition	**What is the definition?** (Spell it out very clearly in words)
	What data items do you need?
	What is the calculation?
	Which patient groups are to be covered? Do you need to stratify? (For example, are there differences by shift, time of day, day of week, severity etc)
Goal Setting	**What is the numeric goal you are setting yourselves?**
	Who is responsible for setting this?
	When will it be achieved by?

Part 2: Measurement process

Collect	**Is the data available?** (Currently available / Available with minor changes / Prospective collection needed)	
	Who is responsible for data collection?	
	What is the process of collection?	
Analyse Calculate measure and present results	**What is the process for presenting results?** eg create run chart or bar chart in Excel	
	Who is responsible for the analysis?	
	How often is the analysis completed?	
Review	**Where will decisions be made based on results?**	
	Who is responsible for taking action?	

Appendix 5:
Reading and further information

1. Directory of Ambulatory Emergency Care for Adults: NHS Institute for innovation and improvement.

2. Ambulatory Emergency Care website: NHS Institute for innovation and improvement.

   www.institute.nhs.uk/quality_and_value/high_volume_care/ambulatory_ emergency_care_.htmland website

3. Audit commission (2012) By definition: Improving data definitions and their use by the NHS. Available from:

   www.audit-commission.gov.uk/health/paymentbyresults/pages/ datadefinitions.aspx

4. Weeler D.J Understanding variation: the key to managing chaos.
   SPC Press, 2000.

5. Lloyd, R. Quality health care: a guide to developing and using indicators. Jones and Barlett, 2004.

6. Further information about SPC and software.

   www.institute.nhs.uk/quality_and_service_improvement_tools/quality_and_ service_improvement_tools/statistical_process_control.html

If you require further copies contact:
01922 742 555 / institute@newaudience.co.uk
quoting 'Ambulatory Care – Guide to measurement for improvement'

www.institute.nhs.uk/aec
www.institute.nhs.uk