Improving Critical Care
Acknowledgements

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The purpose of this guide

This guide has been produced to enable healthcare organisations and their teams to successfully implement a series of interventions to improve the safety and quality of care that their patients receive.

This guide must be read in conjunction with the following:

- Leading the Way to Safety and Quality Improvement
- How to Improve

Further guides are also available to support you in your improvement work:

- How to Use the Extranet
- A Guide to Measuring Mortality
- Improving Clinical Communication using SBAR
- Learning to use Patient Stories
- Using Trigger Tools
- Reducing Patient Identification Errors

These are available from the 1000 Lives Plus office, or online at www.1000livesplus.wales.nhs.uk

Where reference is made to 1000 Lives Plus, this includes the work undertaken as part of the 1000 Lives Campaign and the second phase of this improvement programme - 1000 Lives Plus.

The guide uses examples from the former NHS organisational structures, and where possible this has been acknowledged.

We are grateful to The Health Foundation for their support in the production of this guide.
Improving Critical Care

Improving care, delivering quality

The 1000 Lives Campaign has shown what is possible when we are united in pursuit of a single aim: the avoidance of unnecessary harm for the patients we serve. The enthusiasm, energy and commitment of teams to improve patient safety by following a systematic, evidence-based approach has resulted in many examples of demonstrable safety improvement.

However, as we move forward with 1000 Lives Plus, we know that harm and error continue to be a fact of life and that this applies to health systems across the world. We know that much of this harm is avoidable and that we can make changes that reduce the risk of harm occurring. Safety problems can’t be solved by using the same kind of thinking that created them in the first place. To make the changes we need, we must build on our learning and make the following commitments:

- Acknowledge the scope of the problem and make a clear commitment to change systems.
- Recognise that most harm is caused by bad systems and not bad people.
- Acknowledge the improving patient safety requires everyone on the care team to work in partnership with one another and with patients and families.

The national vision for NHS Wales is to create a world-class health service by 2015: one which minimises avoidable death, pain, delays, helplessness and waste. This guide will help you to take a systematic approach and implement practical interventions that can bring that about. The guide is grounded in practical experience and builds on learning from organisations across Wales during the 1000 Lives Campaign and also on the experience of other Campaigns and improvement work supported by the Institute for Healthcare Improvement (IHI).

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Introduction

The aim of the Improving Critical Care (ICC) work area detailed in this ‘How to Guide’ is to build upon the success of the 1000 Lives Campaign, the Welsh Critical Care Improvement Programme (WCCIP) and Safer Patient Initiative (SPI) in supporting clinical teams to implement the sepsis, ventilator and central line bundles and to promote hand hygiene and improved communication.

The compliance with CVC and Ventilator bundles in Wales has stood at a greater than 95% compliance level for in excess of two years yet the implementation of the Sepsis Bundles has been less comprehensive despite collaboration with the Welsh Critical Care Advisory Group, Critical Care Networks and other stakeholders.

Several Intensive Care Units (ICUs) across Wales have had considerable success in implementing the Sepsis Management bundle as part of WCCIP and the 1000 Lives Campaign and demonstrating compliance at rates greater than 95%. However, critical care mortality due to severe sepsis appears to have remained unchanged. It is now widely acknowledged that early and appropriate treatment must be commenced in acute hospital areas to bring about any change.

The DoH publication of 2000 ‘Comprehensive Critical Care’ made it clear that critical care should be regarded as a patient need which is not restricted to the ICU. The emphasis, therefore, as we move forward will be both on consolidating the gains made within the ICU but, more importantly on strengthening the improvement work for acute and critically ill patients in the wider hospital.

Thus the prevention of localized sepsis will be addressed through spread of the CVC and ventilator care bundles in areas where they are yet to be implemented, the development of systems for the early detection and treatment of severe sepsis, improvement of communications within the ICU and between the ICU and acute hospital areas and the improvement of hand hygiene.

Severe Sepsis

The term severe sepsis covers a number of infectious diseases that result in a common picture of multiple organ failure. It is a condition with high prevalence - about 2.3% of hospital patients and about 27% of intensive care patients. Mortality rates are very high - around 30 - 50% which, in Wales may equate to the deaths of between 700-1100 people in ICU annually. Globally, sepsis kills about half a million people a year: as many as myocardial infarction.

A recent large scale US study has estimated that in cases associated with invasive surgery, attributable mean length of stay due to sepsis was 10.9 days, costs were $32 900, and mortality was 19.5% whereas in cases not associated with invasive surgery, attributable mean length of stay, costs, and mortality due to sepsis were estimated to be 1.9 to 6.0 days, $5800 to $12 700, and 11.7% to 16.0%.

Until recently sepsis has had a low public profile. Reporting of cause of death on death certificates often omits the term severe sepsis so its prevalence has been under-reported. Effective treatments have been hard to come by. Times are changing though and there is a growing international consensus both on the scale of the challenge and the practical ways to bring down mortality rates.
The good news is that the most effective treatments are simple interventions such as giving oxygen, large volumes of intravenous fluids and antibiotics. The main challenge is that these treatments must be given early in the disease process to be effective. The focus then has to be on the early identification of patients with sepsis and delivery of a package of treatments within a few hours of the onset of the disease.

These simple targets are hard to achieve and require us to redesign how patients are monitored and treated throughout the hospital, employing care bundles or pathways of care and transferring critical care skills to acute hospital areas through Outreach, Acute Care or Rapid Response Teams.

**Ventilator-Associated Pneumonia**

Ventilator-associated pneumonia (VAP) is a nosocomial lung infection that occurs in patients receiving mechanical ventilation and for whom the infection was not the reason for ventilation, i.e., the infection commenced after ventilation. Pneumonia is considered as ventilator associated if the patient was intubated and ventilated at the time or within 48 hours before the onset of infection.

Respiratory tract infections, at 24%, are the most common Healthcare Associated Infections (HCAI) in Wales and VAP is the leading cause of death among HCAIs: hospital mortality of ventilated patients who develop VAP is 46%, compared to 32% for ventilated patients who do not develop VAP. In addition, VAP prolongs time spent on the ventilator, length of ICU stay, and length of hospital stay after discharge from the ICU. Strikingly, in the US VAP adds an estimated cost of $40,000 to a typical hospital admission.

As a result of involvement in WCCIP, SPI and 1000 Lives Campaign all Adult General ICUs in Wales have been achieving a greater than 95% compliance with the Welsh Ventilator Bundle since 2007. Reporting of VAP has been mandatory in Wales since September 2008 and several units have reported one or more months with a zero rate of VAP during this time which appears to be associated with various interventions including the ventilator care bundle. The challenge now is to spread this bundle to the specialised ICUs.

**Central Venous Catheter (CVC) related infections**

Central venous catheters (CVCs) are being used increasingly in the inpatient and outpatient setting to provide long-term venous access. CVCs disrupt the integrity of the skin, making infection with bacteria and/or fungi possible. Infection may spread to the bloodstream and haemodynamic changes and organ dysfunction (severe sepsis) may ensue, possibly leading to death.

Forty-eight percent of US intensive care unit (ICU) patients have central venous catheters, accounting for about 15 million central-venous-catheter-days per year in ICUs. Approximately 5.3 central line infections (often termed catheter-related bloodstream infections) occur per 1,000 catheter days in US ICUs. The attributable mortality for such central line infections is approximately 18%. Thus, probably about 14,000 deaths occur annually due to central line infections. Some estimates put this figure as high as 28,000 deaths per year.
In addition, nosocomial bloodstream infections prolong hospitalization by a mean of 7 days. Estimates of attributable cost per bloodstream infection are estimated to be between $3,700 and $29,000 or in excess of 20,000 Euros.\textsuperscript{13,14}

All Wales ICU compliance with the CVC bundles has been monitored through various patient safety programmes and through the Critical Care Networks and has generally been greater than 95% since 2007. In several ICUs there seems to be an association between this high compliance and maintaining a zero rate of Catheter Related Bloodstream Infection (CRBSI) for extended periods of time.

National CRBSI surveillance has been mandatory since September 2007 as part of the Welsh Healthcare Associated Infections Programme (WHAIP). It is thought that the generally low rate of CRBSI as reported through this programme is associated with the implementation of patient safety interventions such as the care bundles.

The challenge now is to spread these bundles to other hospital areas such as Theatres, A&É and CCU.

\textit{Transmission of Infection in Critical Care}

The work is focusing on hand hygiene as a key measure in breaking the chain of cross-infection and compliance with hand hygiene is one of the key process measures that 1000 Lives Plus will be looking at. However, this should not be taken to mean that the other standard precautions are less important.

Transient contamination of Health Care Workers (HCWs) hands occurs while caring for colonised or infected patients. HCWs can contaminate their hands even while performing “low-risk” patient care activities such as taking a pulse or blood pressure, lifting a patient up in bed, or handling items in the patient’s vicinity.

Although wearing gloves when having direct contact with patients can reduce the risk of hand contamination, hands often are contaminated during glove removal. Therefore, cleaning hands before and after having contact with patients or their immediate environment is of paramount importance in reducing transmission of HCAI in ICU. Unfortunately, compliance with hand hygiene remains poor in many hospitals—often well under 50%. It is doubtful whether such low rates of compliance are compatible with efforts to dramatically reduce the rate of HCAI in healthcare (See HCAI How to Guide).

\textit{Communication, Leadership and Organisational Culture}

Changing practice requires a change in organisational culture and attitudes about what is acceptable. Organisations that have nearly eliminated certain types of infections, such as ventilator-associated pneumonia (VAP) and central line infections (CRBSI), have moved towards a culture where these infections are viewed as completely preventable.

The organisational culture within an individual organisation, or even at the local level of an ICU, develops based on overt and subtle messages employees receive. Leadership actions strongly influence employee beliefs as to what leaders consider important, even more so than what is actually said. This includes not only what leaders do, but also what they do not do.
Improving communication in critical care involves the introduction of multi-disciplinary rounds, daily goals, safety briefings and the SBAR communication tool.

References

Improving Critical Care

Driver Diagram

**Content area**

- Reduce mortality and harm from Severe Sepsis
- Reduce mortality and harm from mechanical ventilation
- Reduce complications from central venous catheters (CVCs)
- Reduce transmission of infection in critical care
- Improve communication and create a safety culture in critical care
- Provide patient and family driven care

**Drivers**

- Implement Severe Sepsis Pathway or Sepsis Bundles
- Implement Ventilator Bundle
- Implement oral hygiene
- Implement subglottic suction
- Implement CVC Insertion Bundle
- Implement CVC Maintenance Bundle
- Implement handwashing surveillance
- Implement safety briefings and SBAR to ensure communication within a multi-disciplinary team
- Multi-disciplinary rounds and daily goal setting
- Ensure staff have knowledge and expertise in improvement work
- Appropriate infrastructure: intensivist-led model
- Inclusion of patient/public representation on local critical care improvement team
- Integrate patient/family into improvement work
- Promote open communication among team and family

**Interventions**
Have you set up your team?

You need to consider three different dimensions:

- Organisational level leadership
- Clinical or technical expertise
- Frontline leadership and team membership

See the ‘Leading the Way to Safety and Quality Improvement’ guide; and Appendix B for further information.

Do you know how you will measure outcomes?

For this content area, you should use the following outcome measures:

- Severe sepsis mortality
- Percentage severe sepsis escalation to level 2 or 3 care
- Ventilator associated pneumonia (VAP) rate
- Average length of stay (ALoS) on mechanical ventilation
- Intensive Care Unit (ICU) average length of stay (ALoS)
- Monthly rate of delayed transfers of care (DToC)
- Central venous catheter related blood stream infection (CRBSI) rate
- Days between a CRBSI

See Appendix A for further information.

Do you and your team understand how to apply the Model for Improvement?

The Model for Improvement is a fundamental building block for change and you need to understand how to use it to test, implement and spread the interventions in this guide.

See the ‘How to Improve’ guide and Appendix C for further information.

How are you going to measure process reliability?

In order to improve outcomes for your patients you need to demonstrate you are using these interventions reliably. This means that all the elements of the interventions are performed correctly on 95% or more of the occasions when they are appropriate. You need to do this by using the process measures in this guide.

See the ‘How to Improve’ guide and Appendix A for a summary of all process measures.

How will you share your learning?

Contact 1000 Lives Plus for details of mini-collaboratives and other ways to share your learning and to learn about the progress of other teams.
Drivers and Interventions

This section details the interventions highlighted in the driver diagram which evidence has shown to be effective in this content area. You should use the Model for Improvement to test, implement and spread each intervention, using the listed process to monitor progress.

Driver: Reduce mortality and harm from Severe Sepsis

**Elements of the Surviving Sepsis Campaign Management Bundle**

- Low-dose steroids administered for septic shock in accordance with a standard ICU policy.
- Drotrecogin alfa (activated) administered in accordance with a standard ICU policy.
- Initiate insulin therapy if blood glucose >10mmol/L with target of 8.3 mmol/L (Please see Surviving Sepsis Campaign website for 2009 position statement on changes to this intervention).
- For mechanically ventilated patients inspiratory plateau pressures maintained < 30 cm H2O.

**Elements of the Surviving Sepsis Campaign Resuscitation Bundle**

- Serum lactate measured.
- Blood cultures obtained prior to antibiotic administration.
- From the time of presentation, broad-spectrum antibiotics to be given within 3 hours for ED admissions and 1 hour for non-ED ICU admissions.

In the event of hypotension and/or lactate >4mmol/L (36mg/dL):

- Deliver an initial minimum of 20 ml/kg of crystalloid (or colloid equivalent).
- Give vasopressors for hypotension not responding to initial fluid resuscitation to maintain mean arterial pressure (MAP) > 65 mm Hg.

In the event of persistent arterial hypotension despite volume resuscitation (septic shock) and/or initial lactate >4 mmol/L (36 mg/dl):

- Achieve central venous pressure (CVP) of >8 mm Hg.
- Achieve central venous oxygen saturation (ScvO2) >70%.

**Elements of the Sepsis Six**

- Give 100% oxygen via non-rebreath bag.
- Take blood cultures.
Give IV antibiotics.
Start IV fluid resuscitation with Hartmann’s or equivalent.
Check haemoglobin and lactate.
Place and monitor urinary catheter unless fully mobile (monitor UO).

What are the Surviving Sepsis Campaign Bundles?

The Surviving Sepsis Campaign is an international campaign to reduce mortality and morbidity from sepsis partly through the introduction of Sepsis Care Bundles. These bundles consist of interventions that have solid evidence in improving mortality and consist of 2 elements; the first 6 hours from the diagnosis of Severe Sepsis or Septic Shock (time zero) known as the Resuscitation Bundle and the first 24 hours from diagnosis known as the Management Bundle.

Evaluation of the Surviving Sepsis Campaign has concluded that this multifaceted performance improvement initiative has been successful in changing sepsis treatment behaviours and that this has been associated with a significant reduction in mortality from Severe Sepsis.1

Early experience with the bundles in all Welsh hospitals as part of the 1000 Lives Campaign has highlighted the following difficulties:

- Inconsistency in the early diagnosis of severe sepsis and septic shock.
- Frequent inadequate volume resuscitation.
- Late or inadequate use of antibiotics.
- Frequent failure to support the cardiac output when depressed.
- Frequent failure to control hyperglycemia adequately.
- Frequent failure to use low tidal volumes and pressures in acute lung injury.
- Frequent failure to treat adrenal inadequacy in refractory shock.

To overcome these difficulties the SSC care bundles have, in some areas, been operationalised into a care pathway and in all hospitals the concept of performing the ‘sepsis six’ within one hour of severe sepsis diagnosis has been adopted.

It is obvious that tackling the problem of severe sepsis cannot be the sole responsibility of the ICU and that a level of integration between acute and critical services must exist. With this in mind many hospitals have now set up an Outreach service whereas others have established Acute Care and Rapid Response Teams which operate independently of the ICU.

Measures:

For this intervention, use the following process measures:

% compliance with sepsis management bundle
% compliance with sepsis resuscitation bundle
% compliance with ‘sepsis six’
Score-2-Door time
Applying the Model for Improvement

What are we trying to achieve?
Before starting improvement work it is important to agree upon the eventual outcome. There are a number of process and outcome measures attached to this intervention which are detailed below: improvements in these could be adopted as targets for your improvement.

A new addition to the measures is ‘Score-2-Door’ time which has been developed by a team including Dr Chris Subbe, Betsi Cadwaladr University Health Board as part of a UK wide initiative. The measure is from time of first alert to patient deterioration (trigger “Score”) until admission to ICU (“Door”) and provides a potential means for measurement of the efficiency of escalation to critical care. The data collection form for ‘Score -2-Door’ is included in the appendices.

Teams from UHW, Prince Charles Hospital, Ysbyty Glan Clwyd, Ysbyty Gwynedd and Maelor Hospitals have contributed data to the development of this tool. The ICUs at UHW and Nevill Hall have been providing data to the SSC dataset for many years and are consequently able to draw upon a rich seam of data for improvement targets. The link to the SSC website is included in the appendices.

How will we know that change has been an improvement?
The only way to know whether a change has been an improvement is through measurement. The measures for severe sepsis are listed below and there will be space upon the Extranet for uploading these.

The Medical Assessment Unit at the Maelor Hospital has used an annotation of the compliance with the sepsis resuscitation bundle to demonstrate an extremely low level of escalation to level 2 and 3 critical care. The team can therefore demonstrate that the application of the Sepsis Six and Resuscitation Bundles is effective in reducing the need for ICU admission.

The important thing to remember about the measures is not whether they can be benchmarked with other wards or hospitals but rather whether they are specific to the way your team practice and therefore show improvement over time.

What changes can we make that will result in an improvement?
Remember to include all members of the team in coming up with the changes to test and by using the small scale rapid cycle PDSA methodology these changes can be tried out quickly and with minimal investment.

Ward 4 at Prince Charles Hospital tested out various ways of recording ‘at risk’ patients before hitting upon the idea of using the white board in the office. Now medics, therapists and the Outreach team can prioritise patients quickly and effectively without having to spend time searching for members of the ward team.
Frequently asked questions

How do we start implementing the bundles and collecting the data in acute areas where it is much more difficult than ICU?

It can be more difficult to collect data for improvement outside the contained environment of the ICU but involving the team in developing the documentation can be an invaluable first step. Based upon a template from Ron Daniels of the SSC, the teams at the ICU in UHW and in Velindre Cancer Centre have developed pro formas which detail the patient’s journey through the sepsis pathway from diagnosis to critical care admission.

These forms therefore act as diagnostic tool, treatment guide, education aid and auditable record which can then be stored in the patient’s notes. Both forms are reproduced in the resources section.

Do we need to have an Outreach service before we can start with this improvement?

It is true that hospitals that have a Critical Care Outreach or Acute Care Team in place do seem to have had more success in coordinating the response to severe sepsis to date.

However, there are notable exceptions to this where an individual ward has commenced sepsis work without the direct support of the ICU. A tool that has proved hugely popular with acute ward staff has been the pocket sized aide memoire. Two are reproduced in the resources section of this guide, one from the team at West Wales General Hospital based upon the SSC template which can be printed at A5 size and laminated or the plastic credit card which was developed by the team at the Maelor Hospital in Betsi Cadwaladr University Health Board.

Try changing things on a small scale first, one patient, one shift, one nurse, before rolling out to a larger area.
References and supporting evidence


Improving Critical Care

Driver: Reduce mortality and harm from mechanical ventilation

Interventions

**Welsh ventilator care bundle elements:**

- Elevation of head of the bed to between 30 and 45 degrees
- Daily “sedation vacation” and daily assessment of readiness to wean
- Peptic Ulcer (PU) Prophylaxis
- Deep Venous Thrombosis (DVT) Prophylaxis
- Regular oral care with antiseptic agent
- Sub-glottic suction
- Implement non-physician driven weaning protocol
- Formal swallow evaluations for long term ventilated patients
- Endotracheal tube cuff inflation via minimal pressure technique
- Use protocols and auto-stop points for antibiotics

The Ventilator Bundle

The ventilator bundle that was agreed by participants on the Welsh Critical Care Improvement Programme had four key components:

1. **Elevation of the head of the bed**
   
   Elevation of the head of the bed is an integral part of the ventilator bundle and has been correlated with reduction in the rate of ventilator-associated pneumonia. The recommended elevation is 30-45 degrees.  

2. **Daily sedative interruption and daily assessment of readiness to extubate**
   
   Using daily sedative interruptions and assessing the patient’s readiness to extubate are an integral part of the ventilator bundle and have been correlated with reduction in the rate of ventilator-associated pneumonia.

3. **Peptic ulcer disease (PUD) prophylaxis**
   
   Stress ulcerations are the most common cause of gastrointestinal bleeding in intensive care unit patients, and the presence of gastrointestinal bleeding due to these lesions is associated with a five-fold increase in mortality compared to ICU patients without bleeding. Applying peptic ulcer disease prophylaxis is therefore a necessary intervention in critically ill patients.
4. **Deep Venous Thrombosis (DVT) prophylaxis**

Applying deep venous thrombosis prophylaxis is an appropriate intervention in all patients who are sedentary; however, the higher incidence of deep venous thrombosis in critical illness justifies greater vigilance.\(^\text{14}\)

**Additional elements**

All Welsh Adult General ICUs have demonstrated compliance with this care bundle at a level greater than 95% from 2007 onwards and this is associated in some units with a reduction to zero in the rate of VAP as measured using the HELICS definition as part of the Welsh Healthcare Associated Infection Programme (WHAIP).

The view of VAP as being an inevitable consequence of Critical Care has shifted in Wales and the status of the ventilator care bundle has been established by its inclusion as one of the Welsh Critical Care Quality Indicators which are reported to the Welsh Assembly Government.

So, whilst it is widely accepted that there remains much more to do in the eradication of VAP, this document will not stipulate the inclusion of other elements in the care bundle for the purposes of national data collection.

However it is highly recommended that Critical Care Teams adopt the following two interventions at a local level.

5. **Oral care**

Six hourly use of oral antiseptics (for example, chlorhexidine) should be included as part of the oral hygiene regimen for all patients who are intubated and receiving mechanical ventilation.

The risk reduction for VAP from this regime is about 65\%\(^\text{15}\) and it has consequently been recommended in the NICE guidance on reducing VAP.\(^\text{16}\) It is apparent that many ICUs in Wales are already using Chlorhexidine mouth care with the only reported caution being that the teeth need to be clean prior to administration to reduce staining.

6. **Subglottic suction**

The use of subglottic suction has been shown to be associated with a reduction of risk of VAP of about 50\% and reduced length of ventilation in one meta-analysis.\(^\text{17}\) The ETT and tracheostomy tubes are more expensive but it is thought that this cost will be offset by the benefits of its use. Subglottic suction is becoming standard practice in many Welsh ICUs.

**What changes can we make that will result in improvement?**

A care bundle works most effectively when it becomes incorporated into the normal practice of a team and is accepted as ‘just the way things are done’.

The team at Morriston ICU has, since 2006, included the ventilator care bundle within a larger collection of daily interventions so as to ensure that compliance with the bundle is a natural part of daily patient care.
Measure:

For this intervention, use the following process measures:

% compliance with ventilator bundle

References


Driver: Reduce complications from central venous catheters (CVCs)

Elements of the Welsh Central Line Insertion Bundle

- Wash hands before and after procedure: soap and water or alcohol-based agents.
- Use barrier precautions: gown and gloves must be worn; as much as possible of the patient should be covered with sterile drapes.
- Sterilise skin with 2% chlorhexidine in alcohol and wait until the skin is dry.
- Avoid the femoral site unless it is the last resort.

Elements of the Welsh central line maintenance bundle

- Review necessity of central line every day - and remove promptly if it is not needed.
- TPN should be given via a separate line or a dedicated lumen.
- Access to line must be made using a clean technique.
- Entry site to be checked every day for signs of leakage or inflammation and line removed promptly if these signs are present.

Implement preparation and dressing protocols for management of lines
Use line trolleys and dressing change kits

The central line bundles

The decision was taken as part of the Welsh Critical Care Improvement Programme (WCCIP) to split the single CVC care bundle, that had been used as part of the Michigan study, into two: an insertion and a maintenance bundle.

During WCCIP, SPI and 1000 Lives Campaigns all adult general ICUs in Wales were able to demonstrate compliance with both bundles at a rate greater than 95% and this has been associated in many Welsh ICUs with a reduction to zero in the rate of Catheter Related Blood Stream Infection (CRBSI). Monthly care bundle compliance is now one of the Welsh Critical Care Quality Indicators which is collected by the Welsh Assembly Government.

This is not intended to be a comprehensive list of all elements of care related to central lines; rather, the bundle approach to a small group of interventions promotes teamwork and collaboration. The principles and evidence underlying the bundles is compliant with EPIC II guidance and is also detailed over.

Hand hygiene

One way to decrease the likelihood of central line infections is to use proper hand hygiene. Washing hands or using an alcohol-based waterless hand cleaner helps prevent contamination of central line sites and resultant bloodstream infections. See the next section in this guide and the ‘Reducing Healthcare Associated Infections’ guide.
Maximal barrier precautions

A key change to decrease the likelihood of central line infections is to apply maximal barrier precautions in preparation for line insertion.2,3

Chlorhexidine skin antisepsis

Chlorhexidine skin antisepsis has been proven to provide better skin antisepsis than other antiseptic agents such as povidone-iodine solutions.4,5

Optimal catheter site selection, with subclavian vein as the preferred site for non-tunneled catheters in adults

Percutaneously inserted catheters are the most commonly used central catheters. In a recent prospective observational study assessing catheters placed by a critical care medicine department in a university teaching hospital, the site of insertion did not alter the risk of infection. The authors concluded that the site of insertion was not a risk factor for infection when experienced physicians insert the catheters, strict sterile technique is used, and trained intensive care unit nursing staff performs catheter care.6,7,8,9,10,11

Daily review of central line necessity with prompt removal of unnecessary lines

Daily review of central line necessity will prevent unnecessary delays in removing lines that are no longer clearly needed for the care of the patient. Many times, central lines remain in place simply because they provide reliable access and because personnel have not considered removing them. However, it is clear that the risk of infection increases over time as the line remains in place and that the risk of infection decreases if the line is removed.12

Of all the elements of the care bundles this is perhaps the one that has led to the greatest reduction in central line dwell time and therefore infection rate. Try using safety briefings to draw attention to unnecessary lines or developing line removal as normal practice.

What changes can we make that will result in improvement?

Reducing harm in clinical practice is, in the main, about reducing errors of omission. One way of doing this is to standardise practice and equipment so that the opportunity for error does not present itself.

Many Welsh hospitals have now standardised CVC insertion packs across all clinical areas with a resulting cost saving and one commercial central line manufacturer is now producing central line packs with a CVC Insertion Bundle checklist contained.

Measures:

For this intervention, use the following process measures:

% compliance with CVC insertion bundle
% compliance with CVC maintenance bundle
References


Driver: Reduce transmission of infection in critical care

Interventions:

*Use aggressive hand-washing programme to prevent risk of transmitting infection:*

- Apply epic2 guidance for hospital practice.
- Staff knowledge and competency.
- Use waterless soap.
- Install dispensers in all key locations.
- Do periodic observational monitoring.
- Staff accountability.
- Involvement in the NPSA ‘Clean your Hands’ campaign.
- Provide adequate hand washing facilities e.g. sinks must be convenient for patient/patient and caregiver in consideration of architectural standards that govern where sinks should be.
- Use of soap and water hand decontamination when there is an outbreak of diarrhoea on the unit or when caring for a patient who has diarrhoea.
- Regular audit of practice and feedback of results.

**Hand hygiene**

Education and training in effective hand hygiene has been undertaken in the UK over many years and a new approach is needed to improve the compliance rates significantly. In 2006, IHI prepared a How-to Guide on Hand Hygiene in collaboration with the Centers for Disease Control and Prevention (CDC), the Association for Professionals in Infection Control and Epidemiology (APIC), and the Society of Healthcare Epidemiology of America (SHEA). The Guide was endorsed by APIC and SHEA, and valuable input was provided by the World Health Organization’s World Alliance for Patient Safety through the Global Patient Safety Challenge. The following four components of the hand hygiene intervention package are critical:

1. Clinical staff, including new staff and trainees, understand key elements of hand hygiene practice (demonstrate knowledge).
2. Clinical staff, including new staff and trainees, use appropriate technique when cleansing their hands (demonstrate competence).
3. Alcohol-based hand rub and gloves are available at the point of care (enable staff).
4. Hand hygiene is performed at the right time and in the right way and gloves are used appropriately as recommended by CDC’s Standard Precautions (verify competency, monitor compliance, and provide feedback).
5. Keep soap/alcohol-based hand hygiene dispensers prominently placed and make universal precautions equipment, such as gloves, only available near hand sanitation equipment.

6. Initiate a campaign using posters including photos of celebrated hospital doctors/employees recommending hand hygiene.

7. Create an environment where reminding each other about hand hygiene is encouraged.

Teams should use the best approach for their needs as agreed through PDSA cycles on the units to bring the hand hygiene compliance above 95%. Various audit tools are available to assess hand hygiene compliance. The most commonly used in the UK are:

1. Infection Practitioner’s Society (IPS formerly known as the ICNA) audit tool
2. The Lewisham tool

The first of these provides a tool which assesses the provision of facilities for hand hygiene for staff and patients as well as assessing training. This tool could be used for baseline and subsequent assessments of the availability of facilities and resources for hand hygiene. The second and third listed tools are probably more appropriate for regular assessment of hand hygiene compliance through observation.

All these tools are available through the HCAI ‘How to Guide’.

**What changes can we make that will result in improvement?**

It is important when making clinical changes that all members of the team are involved and feel ownership of the process.

The team at UHW ICU found that the people best placed to enforce handwashing amongst visitors to the unit were the ward receptionists.

**Measure:**

For this intervention, use the following process measure:

% compliance with hand hygiene
Driver: Improve communication and create a safety culture in critical care

Interventions

- Multi-disciplinary rounds and daily goal setting.
- Use safety briefings to identify patients at greater risk.
- Ensure staff have knowledge and expertise in improvement work.
- Ensure communication and collaboration within a multi disciplinary team using a communication tool such as SBAR.
- Appropriate infrastructure: intensivist-led model.
- Inclusion of patient/public representation on local critical care improvement team.
- Integrate patient/family into improvement work.

Teamwork is essential in healthcare today, and communication within the team is indicative of the organisational culture. Everyone must be considered as an equally important member of the team, regardless of their role, and not only encouraged to speak up, but required to do so. If non-clinical or non-professional staff are not treated as equal members of the team, they will be less likely to point out an unsafe condition or take action. For example, environmental services personnel are critical members of the team for infection prevention, not just the clinical personnel who provide direct patient care.

Please see the ‘Improving Clinical Communication Using SBAR’ guide.

Measure:

For this intervention, use the following process measures:

% achievement of multidisciplinary rounds and daily goals
Driver: Patient and family driven care

Interventions

- Inclusion of patient/public representation on local critical care improvement team
- Integrate patient/family into improvement work
- Promote open communication among team and family

Involvement of patients and carers in critical care is still in its infancy in Wales as it is worldwide. However there are a few notable exceptions which may provide inspiration to other ICUs.

The ICU team in the Maelor (BCUHB) and at ABMUHB provide a post-discharge clinic where ex-patients are able to discuss and be aided with any problems they have encountered on return home following discharge.

The Cardiac ITU at Morriston Hospital have developed a patient and carer steering group as part of the accreditation process with Leeds University as a Practice Development Unit. This group is involved with various activities such as fund-raising and improving information for patients and relatives.

(See also the ‘Learning to use Patient Stories’ guide).
Helpful Resources

Extensive evidence supports the care recommendations in this Guide. Selected references as well as practical tools are available on www.1000livesplus.wales.nhs.uk

Links

The Survive Sepsis Resuscitation Pathway and position statement on blood glucose can be obtained from:

www.survivesepsis.org/

Further information can be obtained from the following links:

www.ihi.org
www.aboutsepsis.com
www.survivingsepsis.org/
www.sepsisforum.org/

Epic2 guidance Journal of Hospital Infection 2007; 65 (suppl 1); February S1 - S64
www.epic.tvu.ac.uk/PDF%20Files/epic2/epic2-final.pdf

World Health Organization (WHO): WHO guidelines on hand hygiene in healthcare (Advanced Draft): summary - clean hands are safer hands.
www.who.int/patientsafety/events/05/HH_en.pdf

National Patient Safety Agency (NPSA) guidelines
www.npsa.nhs.uk/cleanyourhands

IHI How to Guide Hand Hygiene.

Healthcare Standards for Wales (WHC 2006 041)

National Standards of Hospital Cleanliness for NHS Trusts in Wales (Performance Assessment toolkit)

HBN 30 Infection Control in the Built Environment
http://howis.wales.nhs.uk/sites3/docmetadata.cfm?orgid=301&Id=22548&pid=647

HTM 07-01 Safe Management of Healthcare Waste

Hazardous Waste Regulations July 2005
www.opsi.gov.uk/SI/si2005/20050894.htm
1. YOUR HOSPITAL
Number of ICU beds ☐ ☐ Number of acute hospital beds ☐ ☐ ☐
Number of members of RRT ☐ Working hours of RRT ☐ ☐
Score used (please attach copy)

2. SCORE-2-DOOR® DATA
Age of patient in years ☐ ☐ ☐ Male ☐ Female ☐
At time of trigger in hospital > 24’s or < 24’s

Speciality
Medicine ☐ Surgery ☐ Orthopaedics ☐ A&E ☐ Others ☐

Trigger
Date ☐ ☐ / ☐ ☐ /09 Time ☐ ☐ ☐ ☐
Rapid Response team called Date ☐ ☐ / ☐ ☐ /09 Time ☐ ☐ ☐ ☐
Arrival in Intensive Care Date ☐ ☐ / ☐ ☐ /09 Time ☐ ☐ ☐ ☐

On admission to Intensive Care
APACHE II score ☐ ☐ Working diagnosis _________________________
Calculated Score-2-Door® ☐ ☐ ☐ ☐

3. OBSERVATIONS AT TIME OF TRIGGER
Respiratory Rate ☐ ☐ bpm Saturations ☐ ☐ %
FiO2 0. ☐ ☐ % Blood pressure ☐ ☐ / ☐ ☐ mmHg
Heart rate ☐ ☐ bpm
Level of consciousness: Alert ☐ Responsive to Voice ☐ Pain ☐
Unresponsive ☐
Temperature ☐ ☐ . ☐ °C Urine less then 0.5 ml/kg /h ☐
Staff worried ☐

4. REASONS FOR DELAY/COMMENTS
________________________________________________________________________

‘Score-2-Door’ Data Collection Form. Courtesy of Dr Chris Subbe, Betsi Cadwaladr University Health Board.
2. Severe Sepsis Pathway Booklet. Courtesy of Gemma Ellis, Cardiff and Vale University Health Board. Based upon an original template from Dr Ron Daniels of the Surviving Sepsis Campaign.
2. Severe Sepsis Pathway Booklet. Courtesy of Gemma Ellis, Cardiff and Vale University Health Board. Based upon an original template from Dr Ron Daniels of the Surviving Sepsis Campaign.
3. Severe Sepsis Pathway Booklet. Courtesy of Gemma Ellis, Cardiff and Vale University Health Board. Based upon an original template from Dr Ron Daniels of the Surviving Sepsis Campaign.
### 6 Hour Resuscitation Bundle (assisted care)

- **Systolic BP <90mmHg or MAP <55mmHg or a fall of >40mmHg from baseline**
  - Yes
  - Lactate >4mmol/l?
    - Yes
      - Severe sepsis, no shock
      - Ensure management plan is documented in notes
      - Ensure hourly obs taken, recorded and acted upon.
      - REASSESS frequently!
    - No
      - Severe shock present!
  - No

---

**Confirm first hour care duties complete**

**Apply Early Goal Directed Therapy**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Time achieved</th>
<th>Initial</th>
<th>Reason not done or result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Ensure patient has received adequate <strong>fluid resuscitation</strong>&lt;br&gt;boluses of 20ml/kg 0.9% saline or Hartmann’s to a max of 60ml/kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>If still shocked&lt;br&gt;(low BP/ low urine output/ high lactate)&lt;br&gt;Ensure <strong>Critical Care</strong> attend urgently</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>If still shocked&lt;br&gt;(low BP/ low urine output/ high lactate)&lt;br&gt;<strong>insert central venous catheter</strong> under USS guidance (only if competent; otherwise seek help)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Aim to achieve <strong>CVP 8-12mmHg</strong> with Care, Check CVP Monitor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Take heparinised sample from central line&lt;br&gt;(use ABG syringe); check <strong>ScvO2 &gt;70%</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Ensure <strong>Hb&gt;7g/dl</strong>; consider transfusion if necessary</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Consider <strong>noradrenaline</strong> if still shocked or <strong>dobutamine</strong> if ScvO2 &lt; 70%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

### 6 hour time check:

- All steps complete? Yes [ ] No [ ]
- Name ____________________________
- Sig ____________________________
- Designation ____________________________
- Bleep/ID Card No. ____________________________

---

2. **Severe Sepsis Pathway Booklet.** Courtesy of Gemma Ellis, Cardiff and Vale University Health Board. Based upon an original template from Dr Ron Daniels of the Surviving Sepsis Campaign.
3. Severe and Neutropaenic Sepsis Screening Tool. Courtesy of Ceri Stubbs, Velindre NHS Trust. Based upon an original template from Dr Ron Daniels of the Surviving Sepsis Campaign.
3. Severe and Neutropaenic Sepsis Screening Tool. Courtesy of Ceri Stubbs, Velindre NHS Trust. Based upon an original template from Dr Ron Daniels of the Surviving Sepsis Campaign.
4. Severe Sepsis Screening Tool (pocket sized). Courtesy of Sandra Miles, Hywel Dda Local Health Board. Based upon an original template from Dr Ron Daniels of the Surviving Sepsis Campaign.
5. Severe Sepsis Screening Tool (credit card sized). Courtesy of Dr Chris Subbe, Betsi Cadwaladr University Health Board.
### Appendix A1 - Measures and Operational Definitions

<table>
<thead>
<tr>
<th>Measure</th>
<th>Operational Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Percentage compliance with sepsis management bundle</strong></td>
<td>1. Determine the numerator: the number of patients fully compliant within 24 hours with the sepsis management bundle in one month.&lt;br&gt;2. Determine the denominator: all severely septic patients treated on ICU in that month.&lt;br&gt;3. Calculate the bundle compliance as a percentage by dividing the numerator by the denominator and multiplying by 100.</td>
</tr>
<tr>
<td><strong>Percentage compliance with sepsis resuscitation bundle</strong></td>
<td>1. Determine the numerator: the number of patients fully compliant within 6 hours with the sepsis resuscitation bundle in one month.&lt;br&gt;2. Determine the denominator: all patients identified as having severe sepsis requiring a response in one month.&lt;br&gt;3. Calculate the care bundle compliance as a percentage by dividing the numerator by the denominator and multiplying the result by 100.</td>
</tr>
<tr>
<td><strong>Percentage compliance with ‘sepsis six’</strong></td>
<td>1. Determine the numerator: the number of patients fully compliant within 1 hour with the ‘sepsis six’ in one month.&lt;br&gt;2. Determine the denominator: all patients identified as having sepsis requiring a response in one month.&lt;br&gt;3. Calculate the care bundle compliance as a percentage by dividing the numerator by the denominator and multiplying the result by 100.</td>
</tr>
<tr>
<td><strong>Severe sepsis mortality</strong></td>
<td>1. Determine the denominator: all patients triggered as having severe sepsis requiring a response in one month.&lt;br&gt;2. Determine the numerator: the number of patients within above set where hospital discharge = dead.&lt;br&gt;3. Calculate the mortality as a percentage by dividing the numerator by the denominator and multiplying the result by 100.</td>
</tr>
<tr>
<td><strong>Percentage Severe sepsis escalation to level 2 or 3 critical care.</strong></td>
<td>1. Determine the denominator: all patients triggered as having severe sepsis requiring a response in one month.&lt;br&gt;2. Determine the numerator: the number of patients within above set that were transferred to level 2 or 3 critical care within that month.&lt;br&gt;3. Calculate as a percentage by dividing the numerator by the denominator and multiplying the result by 100.</td>
</tr>
<tr>
<td><strong>Score-2-Door Time</strong></td>
<td>“Score-2-Door” time is the time from the first high trigger score (in most systems 5 or above) to the door of the Intensive Care Unit. Data collection sheet is included in the resources at the back of this document. This measure can either be collected on an individual patient basis or represented as a monthly average. Outreach or acute care team would be best placed to measure.</td>
</tr>
</tbody>
</table>
## Appendix A2 - Measures and Operational Definitions

<table>
<thead>
<tr>
<th>Measure</th>
<th>Operational Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAP Rate</td>
<td>HELICS defined</td>
</tr>
<tr>
<td></td>
<td>VAP surveillance in Wales is carried out by the WHAIP programme from which a monthly report is prepared and fed back to the ICUs.</td>
</tr>
<tr>
<td>Percent compliance with ventilator bundle</td>
<td>1. Determine the numerator: the number of vented patients in the sample receiving all 4 components of the ventilator bundle.</td>
</tr>
<tr>
<td></td>
<td>2. Determine the denominator: the total number of patients reviewed.</td>
</tr>
<tr>
<td></td>
<td>3. Calculate the percent compliance with the ventilator bundle by dividing the numerator by the denominator and multiplying the result by 100.</td>
</tr>
<tr>
<td></td>
<td>A report on Ventilator bundle compliance is currently generated by the Critical Care Networks.</td>
</tr>
<tr>
<td>ALOS on mechanical ventilation</td>
<td>1. Determine the numerator: the total number of ICU mechanical ventilator days during the month.</td>
</tr>
<tr>
<td></td>
<td>2. Determine the denominator: The total number of ICU patients on a mechanical ventilator during the month.</td>
</tr>
<tr>
<td></td>
<td>Calculate the ALOS on mechanical ventilator by dividing the numerator (total number of vent days) by the denominator (total vent patients) This measure should not be based on a sample. Instead it should include all the vent days and patients in the ICU(s) being studied.</td>
</tr>
<tr>
<td></td>
<td>A monthly report on this measure is generated from the Welsh Critical Care Minimum Dataset (CCMDS).</td>
</tr>
<tr>
<td>ICU ALOS</td>
<td>1. Determine the numerator: ICU monthly patient days.</td>
</tr>
<tr>
<td></td>
<td>2. Determine the denominator: total number of patients discharged from the ICU in the month.</td>
</tr>
<tr>
<td></td>
<td>Calculate the ICU ALOS. All patients discharged in a given month should have their length of stays summed up and divided by the number of patients. This is the average for the month.</td>
</tr>
<tr>
<td></td>
<td>Collect and report this measure monthly for patients admitted to ICU.</td>
</tr>
<tr>
<td></td>
<td>A monthly report on this measure is generated from the Welsh Critical Care Minimum Dataset (CCMDS).</td>
</tr>
<tr>
<td>Monthly rate of delayed transfers of care</td>
<td>A patient who is identified as fit for discharge when the time between requesting a Ward bed and discharge from the Critical Care unit exceeds 4 hours.</td>
</tr>
<tr>
<td></td>
<td>Check against the definition in the CCMDS of “fit for discharge” and the time the discharge was initiated but it was considered that the “clock starts” around the time the ward level bed was requested.</td>
</tr>
</tbody>
</table>
## Appendix A3 - Measures and Operational Definitions

<table>
<thead>
<tr>
<th>Measure</th>
<th>Operational Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central line catheter-Related bloodstream infection (CRBSI) rate</td>
<td>In Wales data on CRBSI in ICU is collected within a mandatory surveillance scheme (Mandatory since September 2007). Data is submitted to the WHAIP team centrally and reported back on a monthly basis in the form of central line infections per 1000 catheter days.</td>
</tr>
<tr>
<td>Days between a CRBSI bloodstream infections</td>
<td>This measure is a cumulative count of the number of days that have gone by with no CRBSIs being reported. Every time a CRBSI occurs the count is started over again. In this case, we are plotting successes between failures. The longer the run of cumulative successes (days with no CRBSIs occurring) the better.</td>
</tr>
</tbody>
</table>
| Percentage compliance with CVC insertion bundle | 1. Determine the numerator: the total number of patients who have all 4 elements of the bundle in place  
2. Determine the denominator: the total number of inserted lines.  
Calculate the percent compliance with the central line bundle by dividing the numerator by the denominator and then multiplying the resulting proportion by 100.  
A report on this measure is currently generated by the Critical Care Networks. |
| Percentage compliance with CVC maintenance bundle | 1. Determine the numerator: the total number of patients who have all 4 elements of the bundle in place.  
2. Determine the denominator: the total number of patients reviewed.  
3. Calculate the percent compliance with the central line bundle by dividing the numerator by the denominator and then multiplying the resulting proportion by 100.  
A report on this measure is currently generated by the Critical Care Networks. |
### Appendix A4 - Measures and Operational Definitions

<table>
<thead>
<tr>
<th>Measure</th>
<th>Operational Definition</th>
</tr>
</thead>
</table>
| Percent compliance with hand hygiene | 1. Determine the numerator: the total number of patient encounters in the sample where appropriate hand hygiene was conducted.  
2. Determine the denominator: the total number of patients in the sample.  
3. Calculate the percent compliance with hand hygiene by dividing the numerator by the denominator and then multiplying the resulting proportion by 100.  
In this case “appropriate” hand hygiene is defined as the observer witnessing that the healthcare provider (e.g., consultant, nurse, and technician) properly cleaned their hand (soap and water or alcohol gel) before contacting the patient and after contact with the patient was made.  
A single contact has two opportunities to fail. This is a simple Yes/No, were BOTH hand hygiene activities observed (before and after patient contact)? If only one cleansing (either before contacting the patient or after contacting the patient) was observed then hand hygiene was not appropriate and a “No” would be recorded by the observer for this particular patient encounter. |
### Appendix A5 - Measures and Operational Definitions

<table>
<thead>
<tr>
<th>Measure</th>
<th>Operational Definition</th>
</tr>
</thead>
</table>
| Percent achievement of multidisciplinary rounds and daily goals | - Determine the numerator: the total number of patients with MDRs who also had DGs documented  
- Determine the denominator: the total number of patients who had MDRs  
Calculate the percent achievement of daily goals by dividing the numerator by the denominator and multiplying the result by 100.  
One day per week (the same day as the MDRs study), conduct an audit for DGs. Look for documented evidence of DGs. Rotate data collection days of the week and shifts in order to avoid “data collection” fatigue and the possibility of having staff change their behaviours because they know the day of the week that will be used to observe this measure. |
Appendix B - Setting up your team

Achieving improvements that reduce harm, waste and variation at a whole-organisation level needs a team approach: one person working alone, or groups of individuals working in an uncoordinated way will not achieve it and this applies equally at all organisational levels.

Whether your improvement priorities relate to 1000 Lives Plus content areas, national intelligent targets or other local priorities, you need to consider three different dimensions in putting your team together:

- Organisation level leadership.
- Clinical or technical expertise.
- Frontline leadership.

There may be one or more individuals on the team working in each dimension, and one individual may fill more than one role, but each component should be represented in order to achieve sustainable improvement.

**Organisation level leadership**

An Executive, or equivalent level Director, should always be given delegated accountability from the Chief Executive for a specific content area; and all staff working on the changes should know who this is. This individual needs sufficient influence and authority to allocate the time and resources necessary for the work to be undertaken. It is likely that accountability will be further delegated to Divisions, Clinical Programme Groups or Directorates and this can help to build ownership and engagement at a more local level. However, it is essential that the leader has full authority over the areas involved in achieving the improvement aim. As changes spread more widely, crossing organisational boundaries, appropriate levels of delegation will need to be reviewed.

When working with frontline teams, it is essential for organisational level leaders to have an understanding of the improvement methodology and to base conversations around the interpretation of improvement data. Reporting of progress to higher organisational levels should also use a consistent data format so that the Executive level leader can report to the Board on progress.

**Clinical/Technical Expertise**

A clinical or technical expert is someone who has a full professional understanding of the processes in the content area. It is critical to have at least one such champion on the team who is intimately familiar with the roles, functions, and operations of the content area. This person should have a good working relationship with colleagues and with the frontline leaders, and be interested in driving change in the system. It is important to look for clinicians or technical professionals who are opinion leaders in the organisation (individuals sought out for advice who are not afraid to try changes).
Patients can provide expert advice to the improvement team, based on their experience of the system and the needs and wishes of patients. A patient with an interest in the improvement of the system can be a useful member of the team. Additional technical expertise may be provided by an expert on improvement methodology, who can help the team to determine what to measure, assist in the design of simple, effective measurement tools, and provide guidance on the design of tests.

**Frontline leadership**

Frontline leaders will be the critical driving component of the team, assuring that changes are tested and overseeing data collection. It is important that this person understands not only the details of the system, but also the various effects of making changes in the system. They should have skills in improvement methods. This individual must also work effectively with the technical experts and system leader. They will be seen as a bridge between the organisation leadership and the day to day work.

Frontline leaders are likely to devote a significant amount of their time to the improvement work, ensuring accurate and timely data collection for process and outcome measures related to the frontline team.

**Characteristics of a good team member**

In selecting team members, you should always consider those who want to work on the project rather than trying to convince those that do not. Some useful questions to consider are the following:

- Is the person respected for their judgment by a range of staff?
- Do they enjoy a reputation as a team player?
- What is the person’s area of skill or technical proficiency?
- Are they an excellent listener?
- Is this person a good verbal communicator within and in front of groups?
- Is this person a problem-solver?
- Is this person disappointed with the current system and processes and passionately want to improve things?
- Is this person creative, innovative, and enthusiastic?
- Are they excited about change and new technology?
Appendix C - The Model for Improvement

Successful improvement initiatives don’t just happen - they need careful planning and execution. There are many things to consider and techniques to employ, which are captured in the driver diagram on page 44. The rest of this section explains the primary drivers and where to get more help in using them.

In any improvement initiative you need to succeed in three areas. You need to generate the Will to pursue the changes, despite difficulties and competing demands on time and resources. You need the good Ideas that will transform your service. Finally you need to Execute those ideas effectively to get the change required.

Will

The interventions you need to build Will are explained in the ‘Leading the Way to Safety and Quality Improvement’ and ‘How to Improve’ guides. They concentrate on raising the commitment levels for change and then providing the project structure to underpin improvement approaches. Spreading changes to achieve transformative change across the whole health system requires strong leadership. We need to create an environment where there is an unstoppable will for improvement and a commitment to challenge and support teams to remove any obstacles to progress.

Ideas

The interventions in this guide describe ideas which evidence shows to be effective for achieving changes that result in improvements. It gives examples from organisations that have achieved them and also advice based on their experience. Methods and techniques for generating new ideas or innovative ways to implement the evidence can be found in the ‘How to Improve’ guide and other improvement literature.

Execution

However, to bring these ideas into routine practice in your organisation, it is essential that you test the interventions and ensure that you have achieved a reliable change in your processes before attempting to spread the change more widely.

1000 Lives Plus uses the Model for Improvement (MFI) which is a proven methodology as the basis for all its improvement programmes. It requires you to address three key questions and then use Plan-Do-Study-Act (PDSA) cycles to test a change idea. By doing repeated small-scale tests, you will be able to adapt change ideas until they result in the reliable process improvement you require. Only then are you ready to implement and spread the change more widely.
Model for Improvement

**Driver Diagram**

- **Aim**
- **Primary drivers**
- **Secondary drivers**
- **Interventions**

**To deliver patient safety and quality initiatives for Health Boards and Trusts**

**Will**

- Create an organisational culture and environment for improvement

**Ideas**

- Evidence Base (The what to)
  - Use the relevant content area ‘How to Guide’ to assess the latest evidence of best practise

**Execution**

- Improvement Methodology (The how to)
  - The Model for Improvement
    - What are you trying to accomplish?
    - How will you know that a change is an improvement?
    - What change can you make that will result in improvement?

- Establish reliable process

**Interventions**

- Engage senior Leadership
- Make links to organisation goals
- Form teams
- Build skills
- Raise awareness
- Appoint clinical champions
- Consult Faculty members to agree standards to be achieved
- Use critical sub sets of key content areas to improve the outcome

**Execution**

- Set SMART aims
- Communicate aims
- Use project charter to provide structure
- Understand what to measure
- Use 7 step measurement process
- Map the process
- Use creative thinking

**PDCA cycles**

- Test - implement - spread - sustain

**Use reliability model**
Model for Improvement-PDSA Cycle

What are we trying to accomplish?
How will we know that a change is an improvement?
What change can we make that will result in improvement?

ACT PLAN
STUDY DO

For more guidance on using the Model for Improvement, see the ‘How to Improve’ guide.

Seven Steps to Measurement

1 Decide aim
2 Choose measures
3 Define measures
4 Collect data
5 Analyse & present
6 Review measures
7 Repeat steps 4-6
One area that bears extra attention is measurement because we have found that this is often the Achilles heel of improvement projects. When measuring your progress, follow the Seven Steps to measurement shown on page 45 and covered in more detail in the ‘How to Improve’ Guide.

The key is to go round the Collect-Analyse-Review cycle frequently:

- **Collect** your data
- **Analyse** - turn it into something useful like a run chart
- **Review** - meet to decide what your data is telling you and then take action

Successful improvement projects all have clear aims, robust measurement and well tested ideas. Use the ‘How to Improve’ guide to ensure your projects have all three.

**What are we trying to accomplish?**

You will need to set an aim that is Specific, Measurable, Achievable, Realistic and Time-bound (SMART). Everyone involved in the change needs to understand what this is and be able to communicate it to others.

**How will we know that change is an improvement?**

It is essential to identify what data you need to answer this question and how to interpret what the data is telling you. The improvement methodology ‘How to Guide’ provides detailed information on the tools, tips and information you need to achieve this, and includes the following advice:

<table>
<thead>
<tr>
<th>Plot data over time</th>
<th>Tracking a few key measures over time is the single most powerful tool a team can use.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seek usefulness, not perfection</td>
<td>Remember, measurement is not the goal; improvement is the goal. In order to move forward to the next step, a team needs just enough data to know whether changes are leading to improvement.</td>
</tr>
<tr>
<td>Use sampling</td>
<td>Sampling is a simple, efficient way to help a team understand how a system is performing.</td>
</tr>
<tr>
<td>Integrate measurement into the daily routine</td>
<td>Useful data is often easy to obtain without relying on information systems.</td>
</tr>
<tr>
<td>Use qualitative and quantitative data</td>
<td>In addition to collecting quantitative data, be sure to collect qualitative data, which is often easier to access and highly informative.</td>
</tr>
<tr>
<td>Understand the variation that lives within your data</td>
<td>Don’t overreact to a special cause and don’t think that random movement of your data up and down is a signal of improvement.</td>
</tr>
</tbody>
</table>
What change can we make that will result in improvement?

The interventions in this guide describe a range of change ideas that are known to be effective. However, you need to think about your current local systems and processes and use the guide as a starting point to think creatively about ideas to test. The improvement methodology guide gives more advice to support you in generating ideas.

Spreading changes to achieve transformative change across the whole health system requires strong leadership. We need to create an environment where there is an unstoppable will for improvement and a commitment to challenge and support teams to remove any obstacles to progress. The guide on ‘Leading the Way to Safety and Quality Improvement’ gives detailed information on interventions that will support this. However, the Model for Improvement, PDSA cycles and process measurement lie at the heart of the transformative change we seek.
Improving care, delivering quality

If we can improve care for one person, then we can do it for ten.

If we can do it for ten, then we can do it for a 100.

If we can do it for a 100, we can do it for a 1000.

And if we can do it for a 1000, we can do it for everyone in Wales.

www.1000livesplus.wales.nhs.uk