Reducing Healthcare Associated Infections
Acknowledgements

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This guide was published in April 2010 and will be reviewed in April 2012. The latest version will always be available online on the programme’s website: www.1000livesplus.wales.nhs.uk

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

We are grateful to The Health Foundation for their support in the production of this guide.
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 that 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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Patients expect to receive healthcare without experiencing any unnecessary complications such as acquiring an avoidable healthcare associated infection (HCAI). For example urinary tract infections are one of the commonest causes of HCAI in Wales and are often associated with the insertion and presence of a urinary catheter. If the urinary catheter was inserted and maintained following evidence based practices put together into a care bundle many of these infections could be avoided.

The overall burden of HCAI was studied using a prevalence survey (snapshot study) across the UK in 2006.1 In Wales the collection of data was compulsory and all adult in-patients in Wales were surveyed for HCAI between February and May 2006. Overall the prevalence of HCAI in Wales was 6.4%, this compared with a rate of 8.2% in England and 5.4% in Northern Ireland. Scotland also conducted a prevalence study during 2006, but used a slightly different method; their rate was 9.5%.2

In Wales the most common HCAIs were respiratory tract infections (pneumonias and lower respiratory tract infections combined) at 24%, surgical site infections (19%) and urinary tract infections (16%). The prevalence of methicillin resistant staphylococcus aureus (MRSA) infections was <1%, i.e. of the 5734 patients surveyed in 2006 - 50 were found to have infections due to MRSA. Of the 364 patients who had HCAIs 14% of them had infections due to MRSA. The prevalence of Clostridium difficile infections was 1%.

The cost to patients in terms of morbidity and mortality is difficult to quantify. Data from death certificates3,4 suggests an average of 63 deaths per annum are due to MRSA in Wales and 78 deaths per annum due to C. difficile. It is likely however that this is an underestimate. An estimate based on American data5 suggests that as many as 321 deaths per annum may be directly attributable to HCAI in Wales with a further 963 deaths where HCAI might be a substantial contributor.

As highlighted in the Wales Audit Office Report: ‘Minimising Healthcare Associated Infections in NHS Trusts in Wales’6 HCAIs result in significant costs for the NHS in Wales. Based on a study sponsored by the Department of Health in England, an estimated cost of £3,154 per case has been attributed to HCAI. This translates into a total cost for the NHS in Wales of £50 million.

The average cost of a C. difficile infection has been estimated to be £4,0007 and each healthcare related bacteraemia regardless of the causative organism has been estimated to cost £6209.8 Based on reported cases from 2006 C. difficile cases alone cost the NHS in Wales a total of £10.3 million. Cases of MRSA bacteraemia reported in the year to March 2007 cost £1.9 million.6
The aim of this content area is to reduce the overall burden of Healthcare Associated Infection across the NHS in Wales. Four key interventions underpin this:

1. Standard Precautions
   - Hand Hygiene
   - Decontamination of Patient Care Equipment and the Environment
2. Isolation Precautions
3. Use of Antimicrobials
4. Insertion and Management of Medical Devices (e.g. urinary catheters, peripheral and central venous catheters)

References

Reducing Healthcare Associated Infections

Driver Diagram

Content Area

Drivers

Interventions

- Standard Precautions
  - Hand Hygiene
  - Decontamination of the Environment

- Isolation Precautions

- Use of Antimicrobials

- Management of Medical Devices

Prevention of Transmission

Prevention & Effective Treatment of Infection

Reduce Healthcare Associated Infections (HCAI)

Patient Engagement

Patient Information and Education

Patient Awareness of Risks

Patient Empowerment and Involvement in Care
Getting Started

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’ How to Guide; and Appendix D for further information.

Do you know how you will measure outcomes?

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

- Incidence of *Clostridium difficile* disease
- Incidence of *Staphylococcus Aureus* Bacteraemia
- Incidence of infections related to medical devices
  - Ventilator associated pneumonias
  - Central line infections
  - Urinary catheter associated infections
  - Bacteraemias related to peripheral intravenous lines

See Appendix C 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’ Tools for Improvement guide and Appendix E 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 C 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.

Please note that tools suggested for use will, where possible, be linked directly from this document using hyperlinks. They will also be available, in addition to tools developed locally by frontline teams, on the WHAIP website www.wales.nhs.uk/WHAIP.

Drivers: Prevention of Transmission
Prevention and Effective Treatment of Infection

Intervention 1: Standard Precautions

Standard precautions are the accepted series of practices which prevent transmission of micro-organisms and infection from patient to patient and patient to healthcare worker. All healthcare workers in primary, secondary or home care must be appropriately trained in the application of these practices before they commence direct patient contact. The aim of standard precautions is to minimise the risk of transmission of bloodborne viruses and other infections from patient to patient and from patient to healthcare worker.

Standard precautions consist of:

- Effective Hand Hygiene.
- Correct use of Personal Protective Equipment (PPE).
- Sharps Management.
- Management of Needlestick Injury.
- Linen Handling and segregation.
- Blood and bodily fluid Spillage management.
- Decontamination of patient care equipment and the environment.
- Handling and Transport of Specimens.
- Waste Management.

When appropriately implemented these measures are designed to reduce the risk of transmission of micro-organisms.

Standard precautions should already be embedded in the daily practices of healthcare professionals on our wards. The aim is to ensure that practice is consistent in all areas of the organisation for all our patients. Audit of the application of standard precautions should also already be part of clinical practice involving regular measurement and monitoring of compliance with the precautions using standardised tools.
Each organisation will have local infection control policies which will guide you through the application of standard precautions in your own area of healthcare. There are also now National Model Infection Control Policies for Wales, which should be taken account of and can be accessed via the following link: www.wales.nhs.uk/sites3/page.cfm?orgId=379&pid=38960

To apply the Model for Improvement in this area in general it will be helpful to review your team’s knowledge of standard precautions and assess the compliance with standard precautions in your area of healthcare. At the time of writing the Infection Prevention Society (IPS) have not yet published the IPS Infection Prevention Quality Improvement Tools, which encompass the elements of standard precautions, they will be launched during 2010. The tools will include both a detailed quality improvement tool for in-patient areas, care homes, endoscopy, theatres, mental health/learning disabilities and for specific clinical practices and also a shorter ‘Rapid Improvement Tools’ for each area. These tools are recommended for use in assessing infection prevention practices in your areas and can be used to highlight areas for improvement.

Where changes in practice are required to improve compliance with the application of standard precautions, small tests of change using the Plan, Do, Study, Act (PDSA) cycle can be used to determine if the proposed change is truly practical in your setting. Monitoring of the change can be done by repeating the Rapid Improvement tool periodically. Implementation of all the standard precautions is required to ensure safe patient care and also to effectively protect healthcare workers.

**Intervention 1a: Hand Hygiene**

Improving hand hygiene practice by applying the principles of the ‘Your 5 moments for hand hygiene’ (NPSA/WHO).

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**Your 5 moments for hand Hygiene**

1. **Before Patient Contact**
2. **Before A Clean/aseptic Procedure**
3. **After Body Fluid Exposure Risk**
4. **After Patient Contact**
5. **After Contact with Patient Surroundings**

*Based on WHO poster ‘Your 5 moments for hand hygiene’ and reproduced with kind permission.*
The ‘Clean Your Hands’ campaign NPSA has been running in the UK since 2005. All NHS hospitals in Wales are already engaged with the ‘Clean your Hands’ campaign and there is now a drive to involve the community also. For further information visit www.npsa.nhs.uk/cleanyourhands

In 2009, Public Health Wales launched the first set of Infection Prevention model policies for Wales - The Hand Hygiene Policy and Procedure as well as the WHO About Save Lives: Clean Your Hands provides additional advice and information on how to improve hand hygiene highlighting the importance of the ‘5 moments for hand hygiene’ as the basis for effective hand hygiene:

- Before patient contact.
- Before clean/aseptic procedure.
- Before aseptic technique.
- After body fluid exposure.
- After patient contact.
- After contact with patient surroundings.

**Measure:**

For this intervention, use the following process measure:

% compliance with hand hygiene
Applying the Model for Improvement

**Aim:** For all healthcare staff to wash their hands appropriately and effectively according to the ‘5-moments’.

**Improvement monitoring:** Through observational audits and feedback.

**Change required:** Areas delivering healthcare will have to define what changes are required to deliver the improvement in hand hygiene in their own environment. PDSA cycles should be undertaken at single patient / single healthcare worker level initially to assess if the changes proposed work in that particular environment. Once reliability of process is achieved in one or two areas the practices should be shared more widely and the work should be spread across the organisation.

**Assessment Tools**

For assessing compliance with hand hygiene, the following tools are examples that can be used:

1. Infection Prevention Society (IPS formerly known as the ICNA) audit tool.
2. The Lewisham tool and adapted versions.
4. Community based workers may wish to use the Public Health Wales Quality Improvement Tool.
5. When launched (2010) the IPS Quality Improvement Tools.

During the 1000 Lives Campaign, improvement in hand hygiene compliance has been demonstrated across the NHS in Wales increasing from 67% in April 2008 to 92% in November 2009. Many of the ward areas are using the Lewisham tool or an adaption of the tool; observation of practice is conducted until 20 opportunities for hand hygiene are assessed or for 20 minutes of time per week.
Examples of Local Practice

Acute Sector

Example of improvement of hand hygiene compliance by Betsi Cadwaladr University Health Board (East Division)

The East Division observed hand hygiene practice for 80 opportunities per month, per ward which provides robust data that can reliably demonstrate hand hygiene compliance. The graph below demonstrates the improvement over the months through the Safer Patient Initiative (SPI) work and onto the 1000 Lives Campaign time period.

Betsi Cadwaladr University Health Board (East Division) Hand Hygiene compliance on medical and surgical wards (n=16 wards)

Community sector

A number of improvements have taken place within the primary care settings to facilitate hand hygiene: work has focussed on the provision of facilities for hand hygiene for staff and patients as well as assessing training needs and delivering more education in hand hygiene. Undertaking observational audits has proved difficult in areas where single workers are delivering care; therefore improvement will have to be monitored in a different way in primary care, focussing on evidence of knowledge of the 5 moments and demonstration of knowledge and technique.
Reducing Healthcare Associated Infections

Top Tips

- Engagement of all healthcare staff in the delivery of effective hand hygiene is key.
- Champions / role models at a senior level should be considered.
- Engage all staff on the ward / unit in undertaking the observational audits.
- The Infection Control team can support the work and may do benchmarking audits, but the bulk of the audits should be conducted at ward / unit level.
- Ensure regular observational audits with timely feedback of key data.
- A minimum of 15 - 20 opportunities for hand hygiene should be observed per area of practice per week to ensure data can be assessed and demonstrate improvement.
- The result should be fed back to staff at handover and also displayed on walls of the ward for staff, patients and relatives to view.
- A “blame culture” related to the results of observational audits is not helpful and should be avoided.

Patient Engagement

A key part of the ‘Clean Your Hands’ campaign has been to involve patients in the process to encourage improvements in hand hygiene by healthcare staff. Within the campaign they encourage patients to question healthcare staff as to whether or not they have washed their hands appropriately. For more information and resources in support of the “It’s OK to ask” initiative, follow the link below:

www.npsa.nhs.uk/cleanyourhands/about-us/patient-involvement/
**Intervention 1b: Decontamination of Patient Care Equipment**

To have robust processes in place to ensure all patient care equipment is appropriately decontaminated between patients to prevent the spread of infection.

Care equipment that is used between patients can harbour organisms associated with HCAI. This includes thermometers, blood pressure cuffs, pulse oximeters, IV pumps, stethoscopes and commodes. Such items should be decontaminated routinely for all patients, just as practicing hand hygiene should be routine. Healthcare workers should receive training on and understand the importance of decontamination of care equipment and should be aware of their responsibilities to ensure that decontamination happens. (Epic 2: National Evidence Based Guidelines for Preventing Healthcare Associated Infection in NHS Hospitals in England).

**Measure:**

For this intervention, use the following process measures:

- % compliance with care bundle developed for decontamination of a piece of care equipment.
- % score using the IPS Quality Improvement Tool.

**Applying the Model for Improvement**

**Aim:** Choose a piece of care equipment that, from your experience in your area or from the results of audits, is not always decontaminated appropriately between patient use. The aim is to develop a process that ensures that the equipment is decontaminated appropriately between patient use on all occasions.

**Improvement monitoring:** Environmental audits can be used or develop a checklist for the process developed and use the compliance with the checklist as an indicator for improvement.

**Change required:** The change required will be the process that needs to be developed to ensure that decontamination occurs with ownership of the issue at clinical / unit level. PDSA cycles should be used to test the appropriateness and practicality of delivering the changed practice.

**Assessment Tools:**

Clean Safe care High Impact Intervention: 8 Cleaning and decontamination of clinical equipment

IPS Infection Prevention Quality Improvement Tools to be launched 2010.
Abertawe Bro Morgannwg University Health Board (ABMUHB)

An item of care equipment which is frequently used for patients infected with HCAI is the commode. Staff recognised the risk of spreading infection associated with the commode. By using the PDSA cycle, ward staff, with the support of the ICT, developed a care bundle for cleaning and decontaminating the commode. The care bundle is used as one of the interventions to reduce *C. difficile* on the ward. The ward staff monitored their compliance by checking that the care bundle was delivered reliably. Days between *C. difficile* infections was used as an outcome measure to reflect on the overall success of their interventions to reduce *C. difficile*. Introducing the commode cleaning bundle on the ward contributed to their actions to reduce *C. difficile* disease and the ward went 197 days between cases of *C. difficile* infection.

Cwm Taf Health Board

As part of the Cwm Taf Health Board strategy to reduce healthcare associated infection, weekly environmental audits are carried out by the ward staff during outbreaks or periods of high rates of HCAI on the ward. Such interventions highlight the importance of environmental cleanliness and support the actions needed to bring outbreaks of infection under control.
Top Tips

- Ensure staff are trained to undertake local environmental / equipment audits so that key problem areas can be identified.

- Develop a local bundle for decontamination of care equipment using local policy. Use PDSA cycles to implement.

- Report the results of local audits to ward staff and display results to patients and visitors. It is essential to have clear guidance as to whose responsibility it is to clean all areas and patient care equipment. For example: Floors - hotel services, beds (mattresses and bedsteads may be allocated to different members of staff) and commodes - nursing staff.

Patient Engagement

The use of tape to show that a commode or a bed has been cleaned and is ready for the next patient to use can engender confidence in the patient. If this became routine practice across all healthcare environments within an organisation with accompanying information, patients / clients could also be more engaged with alerting staff to problems when decontamination appears not to have occurred satisfactorily. These are models which have already been adopted in private concerns such as hotels and restaurants, and have been successfully applied in some pilot areas within the 1000 Lives Campaign.
Intervention 2: Isolation Precautions

In addition to standard precautions, in some instances specific isolation of patients is required. Various guidance documents in respect of specific diseases such as Tuberculosis recommend isolation of cases (e.g. “open” TB and MDRTB) in negative pressure isolation rooms. (NICE guidance for the management of Tuberculosis) Clinical teams should consider the guidance available to them with advice from infection control to ensure that there is a clear policy in place for the isolation of patients with particular conditions. All organisations will have a local infection control policy / procedure on isolation precautions. The National Infection Control Model Policies for Wales will have a policy developed on this in relation to transmission based precautions in due course.

Currently within the NHS in Wales, isolation facilities (single rooms) are often insufficient in number to ensure that all patients who require isolation can be housed in a single room. The aim of this intervention is to develop systems/ processes that optimise the use of the isolation facilities available and to consider the use of cohort wards, dedicated wards or dedicated areas for the management of specific diseases such as infectious diarrhoea, *C. difficile* or respiratory viruses such as ‘swine flu’ as examples.

**Measure:**

For this intervention, use the following process measure:

- Monitor incidence of episodes of “failures to isolate”

**Applying the Model for Improvement**

**Aim:** To optimise the use of available isolation facilities.

**Improvement Monitoring:** Monitoring of critical incident reports of failure to isolate patients.

**Change Required:** Development of a system or risk assessment tool that optimises the use of side rooms and is easy / practical for ward staff / bed managers to use. PDSA cycles should be used to assess if the proposed change is practical in that area.

**Intervention Tools**

Kettering - Infection Predictor Tool, Kettering NHS trust
www.clean-safe-care.nhs.uk/ArticleFiles/Files/Kettering-Predictor-Tool.pdf

Safe Clean Care -Isolation patients with healthcare associated infection
Top tips

- Engagement of all healthcare staff in the need for correct isolation of patients facilitates the decision making process.
- Bed-Management teams must be involved.
- Keep documentation and guidance as simple as possible so that it is easily followed at times of high pressure for example during the winter months when bed pressures are high.

Patient Engagement

Frequently complaints to NHS organisations related to healthcare associated infections revolve around communication with patients regarding the acquisition of a HCAI or the placement of a patient in isolation. Patients should always be provided with full information about their condition and the reasons for placing them in a particular area / side room or cohort ward. It may be helpful to develop information leaflets in advance to support this process.
Intervention 3: Use of Antimicrobials

The development and use of antimicrobials has revolutionised our ability to treat infections over the last century. However as each antimicrobial has been developed, organisms have developed resistance to them and over use of antimicrobials has led to the development and spread of antimicrobial resistant organisms in both hospitals and the community. Antimicrobial use is also a major risk factor for the development of Clostridium difficile-associated diarrhoea.

Data published by the Public Health Wales Antimicrobial Resistance Programme shows that antimicrobial use across primary and secondary care is common and variable across Wales:

- In primary care in 2008, there were 2,417,104 antimicrobial prescription items dispensed across Wales (ie almost 1 antibiotic for every member of the population). Dispensing varied between “old” local health boards from 487.9 prescriptions/1000 PUs per annum to 659.5 prescriptions/1000 PUs per annum.
- In secondary care in 2007 there was a two-fold variation in antimicrobial consumption between hospitals ranging from 768 DDD (defined daily doses)/1000 BD (bed days) to 1468 DDD/1000 BD.

A point prevalence survey of antimicrobial use in secondary care in 2009, surveyed 4888 patients across Wales. Overall 31% of patients were receiving an antimicrobial, with 9.6% prescribed antimicrobials for a HCAI, and 5.2 % receiving an antimicrobial for prophylaxis.

To deliver improvements in antimicrobial the following key points must be followed:

**Acute settings**

- All units should have detailed guidance for the management of commonly-encountered infections.
- All prescriptions for an antimicrobial should specify the planned duration of therapy.
- For all antibiotics prescribed the indication for the prescription should be recorded in the patient’s notes.
- Antimicrobial prescriptions should be reviewed with the results of Microbiology tests at 48 - 72 hours.

**Community settings**

- Antimicrobials should be prescribed according to agreed policies.
- Patients should be educated about the limitations of antimicrobials in relation to sore throats, coughs and colds.
Measures:
For this intervention, use the following process measures:

- % compliance with documentation in patient notes of the indication for antimicrobial prescription.
- % Compliance with recording the duration of the antimicrobial treatment course on the drug chart.
- % prescriptions not consistent with local guidance (in antimicrobial choice, dose, route, or duration).
- Monthly compliance with the use of antimicrobials in a GP practice or community hospital / care home (see also above).
- % compliance with a checklist or care bundle or “information sticker” used to improve antimicrobial prescribing.

Applying the Model for Improvement

Aim: To Improve the Use of Antimicrobials.

Improvement Monitoring: Monitoring of compliance with the local antimicrobial policy; use of a checklist with monitoring of compliance through completed checklists; audit of antimicrobial prescribing on a regular basis.

Change Required: Development of a system to support an improvement in the way that antimicrobials are prescribed. This may be through a checklist approach or stickers in notes, coupled with further education of prescribers and engagement of prescribers in making the necessary changes. Tools for educating the public may be trialled in primary care. All of these changes can be tested using a PDSA cycle to assess appropriateness and effectiveness in your area of healthcare.

Aneurin Bevan Health Board – Nevill Hall Hospital

The infection control team at Nevill Hall hospital, in collaboration with the antibiotic pharmacist, as well as the ward pharmacist has undertaken work on improving antibiotic prescribing. Monthly audits have been conducted to look at the ward’s compliance with formulae and local guidelines, whether the duration is specified on the prescription and if the duration specified was adhered to.
Improving antibiotic prescribing across the Health Board will assist to reduce HCAI and the development of resistant organism. Wrexham LHB introduced a number of interventions in their practice to address the problem of increased telephone prescriptions for antimicrobials. The initial intervention was a poster campaign at the surgery informing the practice population to stop telephone request for prescriptions, as well as the poster information the repeat request prescription slip was redesigned which included information about telephone prescription. A weekly and monthly count of the practice prescribing was charted and displayed on the notice board in the area the area that script are signed. Educational sessions were set up with the surgery staff to reinforce the message about antibiotic prescribing. With the appointment of the triage nurse and the increase staff and patient awareness improvement was seen in the antibiotic prescribing as demonstrated in the graph below.

**Top Tips**

- The Health Board should ensure they have an antimicrobial policy for the acute and community sectors.
- Engagement of the prescribers is essential to the success of this work.
- Education of doctors and nurse prescribers regarding antimicrobial prescribing should be undertaken as the interventions are launched in a ward area / unit or surgery.
- Setting up a multi disciplinary team consisting of a Consultant Microbiologist, Antibiotic Pharmacist, Ward Pharmacist and the prescribing medical team to take this agenda forward is helpful.
- Care homes should also have policies for the prescribing and administration of antimicrobials.
**Patient Engagement**

Patient education regarding the use of antimicrobials is crucial to underpinning a more limited approach to the issuing of antimicrobials in general practice, for example in relation to sore throats and colds. Patient information leaflets are helpful in this regard. Patients should always be informed when they are receiving antibiotic therapy and for what indication. They should be advised to complete the given course.

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**References**

- Antimicrobial Dispensing In Primary Care in Wales (2006 - 2008)
- Antimicrobial Usage in Secondary Care in Wales (2005 - 2008q1)
Intervention 4: Management of Invasive Devices

Patients with invasive devices, such as central venous catheters, urinary catheters and peripheral vascular cannulae are at greater risk for developing HCAIs. These devices bypass the natural barriers to infection such as the skin and urinary flow. Fastidious care of invasive devices can greatly diminish the occurrence of device related healthcare associated infection. Many hospitals have reduced or eliminated device-related infections through the implementation of ‘bundles’ - groupings of best practices that individually improve care, but when applied together result in substantially greater improvement. The science supporting each bundle component is sufficiently established to be considered the standard of care.

Care bundles for the insertion and maintenance of central venous catheters and for the prevention of ventilator associated pneumonia have already been successfully introduced on all critical care units in Wales. Details can be found in the ‘Improving Critical Care’ How to Guide. To reduce the incidence of infections related to central venous catheters placed in other specialty areas within the organisation it is recommended that the successful work on the critical care units is spread to other areas of the organisation. In addition the adoption of a similar approach to the insertion and maintenance of peripheral venous cannulae will contribute to a reduction in blood stream infections including MRSA 1,2

Urinary tract infection associated with the use of urinary catheters is one of the commonest causes of HCAIs (reference prevalence survey 2006). The introduction of an urinary catheter care bundle should be used as an intervention to reduce the incidence of such infections.

The interventions recommended are:

- Implement care bundles for central venous catheter insertion and maintenance (CVC) across all areas of the Health Board where such devices are used.
- Implement a peripheral vascular catheter care bundle (insertion and maintenance).
- Implement an Urinary Catheter care bundle (Catheter Associated Urinary Tract infection CAUTI bundle).
- Implement a care bundle to prevent ventilator associated pneumonia.
Measures:
For this intervention use the following process measure:
% Compliance with the care bundles.
The outcome measures for these interventions are:
Incidents of infections related to medical devices:
- Ventilator associated pneumonia
- Central line infections
- Urinary catheter associated infections
- Bacteraemias related to peripheral intravenous lines may be incidence/1000 device related days or time between event monitoring

Applying the Model for Improvement
Aim: To reduce the incidence of infections related to medical devices.


Change Required: Incorporating the care bundle into routine practice will need to be agreed and systems developed to support the care bundles. PDSA cycles should be undertaken to ensure that the care bundles can be delivered reliably and consistently for all patients in your ward / unit / surgery.

Care Bundles
Care bundles for Peripheral venous cannulae and urinary catheters have been developed by Health Protection Scotland examples of bundles are given in the appendix or visit the Health Protection Scotland web site www.hps.scot.nhs.uk/haiic/ic/guidelines.aspx#bundles

Time between event monitoring
Abertawe Bro Morgannwg University Health Board
During the 1000 Lives Campaign, ABMUHB implemented a number of improvements in reducing device related infection. Morriston Hospital has undertaken work on central line care bundles for the renal unit. Their ongoing work to reduce CVC infections within renal medicine has resulted in a period of 224 days without a central line related infection.
ABMUHB frontline staff and the infection control team have also been working on preventing Catheter Associated Urinary Tract Infection (CAUTI). Towards the end of 2009 100% compliance had been achieved on a ward at Neath and Port Talbot Hospital.
Improving invasive device management and preventing associated infection not only occurs within secondary care but also in primary care. A number of Local Health boards have carried out training and education in improving medical device management.

Denbighshire Local Health Board in conjunction with their intense education developed a Urinary Catheter pack for care homes to report CAUTI see www.wales.nhs.uk/WHAIP

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**Top tips**

- Existing care bundles are available for health boards to adapt and use. The IHI recommends the use of the HPS care bundles
- Due to the low numbers of device related infections it is best to use the safety cross to demonstrate improvement by recording days between events
- Ward staff should take responsibility for measuring the compliance with care bundle
- Frontline staff should be educated in the use of care bundles
- Documentation should be kept as simple as possible, agreed as quickly as possible within the pilots and then used as a standard with as few changes as possible made to the documentation as you spread to avoid confusion

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**Patient Engagement**

Patients who have long term invasive devices in place (such as long term urinary catheters and long term central lines) often have a key role in the care of these devices. Information, training and support in aspects of the care bundle approach to caring for these devices may be very helpful to the patient and patient family.

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**References**


2. *Reflecting on the nursing contribution to vascular access; Jackson A 2008, British Journal of Nursing 12(11), p 657-665*
Helpful Resources

- Epic2 guidance Journal of Hospital Infection 2007; 65 (suppl 1); February S1 - S64 www.epic.tvu.ac.uk/PDF%20Files/epic2/epic2-final.pdf
- National Patient Safety Agency (NPSA) guidelines www.npsa.nhs.uk/cleanyourhands
- Information and key documents on Decontamination can be obtained through Welsh Health Estates: www.wales.nhs.uk/sites3/page.cfm?orgid=254&pid=14031
- Epic2 guidance Journal of Hospital Infection 2007; 65 (suppl 1); February S1 - S64 www.epic.tvu.ac.uk/PDF%20Files/epic2/epic2-final.pdf
- The Path of Least Resistance; Report by the DH Standing Medical Advisory Committee sub-Group on Antimicrobial Resistance. www.advisorybodies.doh.gov.uk/smac1.htm
Cochrane Review: Interventions to improve antibiotic prescribing practices for hospital inpatients.
Epic2 guidance Journal of Hospital Infection 2007; 65 (suppl 1); February S1 - 64 www.epic.tvu.ac.uk/20Files/epic2/epic2-final.pdf
Appendix A - Linking Interventions to target specific issues

1. *Clostridium difficile* (*C. difficile*)

*C. difficile* infection is a cause of diarrhoea, which can be anything from a mild episode to a severe disease that can lead to death. It is considered to be a healthcare associated infection due to the fact that the combination of antimicrobial exposure and acquisition of the organism is required before the disease develops. The organism survives well in the environment due to its ability to produce spores and it is also able to grow in the gut when other gut organisms have been affected by the use of antimicrobials.

The key measures / interventions required to reduce the incidence of *C. difficile* disease are summarised in the driver diagram above. All the measures need to be implemented to realise a significant reduction in *C. difficile* disease. These interventions all applied together could be considered as a care bundle to prevent *C. difficile* disease being acquired and spread.

The interventions and how they should be applied are all listed in the previous sections of this document.

Measures:

For this intervention, use the following process measures:

- Incidence of *C. difficile* disease
- Time between event monitoring

Useful guidance and tools

*Clostridium difficile infection: How to deal with the Problem* Department of Health England, Health Protection Agency 2009


CDI care bundle - Health Protection Scotland

www.hps.scot.nhs.uk/haiic/ic/CDICareBundle.aspx

High Impact Intervention no 7. Care bundle to reduce the risk from Clostridium difficile. Department of Health England.

**Clostridium difficile (C. difficile)**

Driver Diagram

- **Content Area**
  - Reducing *C. difficile*

- **Drivers**
  - Prevention of Transmission

- **Interventions**
  - Hand hygiene compliance
  - Isolation
  - Environmental Cleanliness
  - Decontamination of equipment
  - Antimicrobial Use
2. Blood Stream Infections including MRSA bacteraemia

Secondary blood stream infections are a significant healthcare associated infection. As with the management of C. difficile the introduction of a series of interventions together is the most effective way to reduce blood stream infections overall. Invasive devices are a major source for blood stream infections in the acute and community sectors and improvement in the incidence of infection can be achieved by improving practice in relation to the insertion and maintenance of invasive devices by the use of care bundles. Key to reducing the incidence of blood stream infections due to resistant organisms is the appropriate use of antimicrobials, but it is also important to ensure that blood stream infections when they do occur are correctly treated with appropriate antimicrobials.

The interventions and how they should be applied are all listed in the previous sections of this document.

**Measures:**
For this intervention, use the following process measures:

- Incidence of Staphylococcus aureus bacteraemia (blood stream infection)
- Incidence of blood stream infections in total related to the use of medical devices
- Time between event Monitoring

**References**

Blood Stream Infections including MRSA bacteraemia

Driver Diagram

**Content Area**

Reducing Blood stream Infections

**Drivers**

Prevention of Transmission

Isolation

Environmental Cleanliness

**Interventions**

Hand hygiene compliance

CVC care bundle
Peripheral cannula care bundle
Urinary Catheter care bundle

Antimicrobial Use
Appendix B - Frequently Asked Questions

Q. Who should carry out the audits and collection of data?
A. Ownership of the data should be the responsibility of the frontline staff, implementing improvement is the responsibility of all multi disciplinary staff for the safety of the staff. If the work is carried out by single person it very difficult to sustain the work over a long period of time.

Q. Who can help me with analysing the information and measurement?
A. There is a separate ‘How to Guide’ on measurement which provides advice on how to take forward the required measurements for improvement. Within your organisation there will be individuals who have been trained in improvement methodologies through the Safer Patient Initiative and the 1000 Lives Campaign. The Infection Control Team locally may be able to provide advice regarding the specific measurements required for the HCAI work. The Welsh Healthcare Associated infection Programme team provide national and Health Board based data on HCAI and can also provide support and advice in relation to information collection and analysis. A course on HCAI ‘Information for Action’ is held annually by the WHAIP team in October.

Q. How many observational audits should be carried out to improve compliance with hand hygiene?
A. The recommendation for undertaking observational audits is to observe for 20 hand hygiene opportunity or to for 20 minutes during a shift. However to have reliable and robust data it is recommended that a minimum of 80 hand hygiene opportunity per ward per month should be observed to ensure reliable compliance with hand hygiene.

Q. Is Reducing Healthcare Associated Infection work the responsibility of the infection prevention and control team (IP&CT)?
A. The IP&CT are there to guide and assist frontline staff to implement the work. Ward and departmental staff should be responsible of identifying areas of concerns undertaking PDSA cycle to test for change, and using the IP&CT as a resource

Q. How do you measure reduction in healthcare associated infection?
A. Many infections may occur infrequently within healthcare establishment and might difficult to demonstrate improvement if the numbers are low. To demonstrate improvement for such low numbers it best to use time between episodes of infection. If the ward/department/ care home are trying to improve on high numbers of infection then using rate as a measurement is accepted.
Appendix C - Measures and Operational Definitions

Tools have been hyperlinked to this document where possible. Otherwise please go to the WHAIP website www.wales.nhs.uk/WHAIP for all the improvement tools listed within this document and also for shared care bundles, care pathways and improvement tools developed at local level by frontline teams across Wales.

**Reporting**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Operational Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>% compliance with hand hygiene</td>
<td>The percentage of times that staff are observed to perform appropriate hand hygiene at each opportunity for hand hygiene observed.</td>
</tr>
<tr>
<td>% compliance with care bundle developed for decontamination of a piece of care equipment.</td>
<td>The percentage of times that the procedure / care bundle for cleaning the piece of care equipment is delivered in full.</td>
</tr>
<tr>
<td>% score using the IPS Quality Improvement Tool.</td>
<td>The IPS Quality Improvement Tools when launched can be applied repeatedly to assess if there is improvement in the score related to the introduction of specific interventions.</td>
</tr>
<tr>
<td>Monitor incidence of episodes of “failures to isolate”</td>
<td>Each time a patient that requires isolation to contain an infection cannot be isolated an incident form should be generated. The numbers of episodes of “failure to isolate” a patient appropriately should be documented and a monthly total can be used to assess improvement.</td>
</tr>
<tr>
<td>% compliance with documentation in patient notes of the indication for antimicrobial prescription.</td>
<td>The indication for the prescription of antimicrobials should be documented in the notes, the presence of this documentation can be determined by audit on a regular basis. All patients receiving antimicrobials in a given area should be audited. Those that have had the indication for their prescription documented in their notes should be counted and expressed as a percentage of the total number of patients on antimicrobials. Target 95%</td>
</tr>
<tr>
<td>% Compliance with recording the duration of the antimicrobial treatment course on the drug chart.</td>
<td>An antimicrobial should be prescribed for a set period of time. This should be clearly documented on the drug chart. The presence of a specified duration on the drug chart can be determined by audit on a regular basis. All patients receiving antimicrobials in a given area should be audited. Those that have had the duration of the antimicrobial treatment course clearly marked on their drug charts should be counted and expressed as a percentage of the total number of patients on antimicrobials. Target 95%</td>
</tr>
<tr>
<td>% prescriptions not consistent with local guidance (in antimicrobial choice, dose, route, or duration).</td>
<td>All organisations should have an antimicrobial policy / local guidance. Regular audit of antimicrobial prescriptions can assess how many prescriptions are given according to local guidance. Variance from guidance may be appropriate, but high rates of inconsistency should prompt guidance review. Target &lt;10% of prescriptions should be outside the local antimicrobial guidance.</td>
</tr>
<tr>
<td>Monthly compliance with the use of antimicrobials in a GP practice or community hospital / care home</td>
<td>This is a measure of compliance with the use of antimicrobials within the community in line with antibiotic usage guidance, antibiotic formularies and compliance with duration of therapy. (see also above)</td>
</tr>
<tr>
<td>% compliance with a checklist or care bundle or “information sticker” used to improve antimicrobial prescribing.</td>
<td>Organisations may wish to introduce a checklist / care bundle / information sticker to improve the prescribing practices with respect to antimicrobials. A measure can then be developed to monitor compliance with the use of these tools. Audit of all the patients on antimicrobials in a given area to assess if these tools have been used can be expressed as a % of the total number.</td>
</tr>
<tr>
<td>% Compliance with care bundle of the insertion and maintenance of the device.</td>
<td>This measure can be applied to whichever device is being considered for improved management. Care bundles for the insertion and maintenance of Central lines and for the prevention of ventilator associated pneumonias have already been implemented across the critical care units in Wales. The central line care bundles can be used in other areas of the healthcare organisation where central lines are being inserted or cared for (including long term lines in the community). Care bundles for the insertion and maintenance of peripheral cannulae and for urinary catheters are also available and can be monitored in this way.</td>
</tr>
<tr>
<td>Time between event monitoring</td>
<td>The number of days between an episode of central line infection, or infection related to a peripheral cannula or an urinary tract infection related to a catheter can be counted as an indicator of improvement. The aim is to increase the numbers of days that can be counted as infection free. Every time an infection occurs the count is started again.</td>
</tr>
<tr>
<td>Incidence of C. difficile disease</td>
<td>National and local data exists on the numbers of cases of C. difficile occurring within the healthcare area. Improvement can be monitored by looking at the overall numbers of cases and monitoring the numbers over time or a rate can be studied using a denominator of admissions (usually used per 1000 admissions) or bed days (per 100,000 bed days)</td>
</tr>
<tr>
<td>Time between event monitoring:</td>
<td>The number of days between episodes of C. difficile disease can be counted as an indicator or improvement. The aim is to increase the number of days that can be counted between episodes of C. difficile disease. Every time an infection occurs the count is started again.</td>
</tr>
<tr>
<td>Incidence of Staphylococcus aureus bacteraemia (blood stream infection)</td>
<td>National and local data exists on the numbers of cases of Staph. aureus bacteraemia including MSSA and MRSA. Improvement can be monitored by looking at the overall numbers of cases and monitoring the numbers of cases over time. A rate can also be used normally the denominator applied is per 100,000 bed days.</td>
</tr>
<tr>
<td>Incidence of blood stream infections in total related to the use of medical devices.</td>
<td>Each episode of secondary blood stream infection picked up in relation to the presence of a central / peripheral cannula or an urinary catheter could be monitored. Improvement can be monitored by looking at the overall numbers of cases per month.</td>
</tr>
<tr>
<td>Time between event Monitoring:</td>
<td>The number of days between episodes of bacteraemia related to the delivery of healthcare can be counted as an indicator of improvement. The aim is to increase the number of days that can be counted between each episode of blood stream infection.</td>
</tr>
</tbody>
</table>
Appendix D - 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 unco-ordinated 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 wants to improve things?
- Is this person creative, innovative, and enthusiastic?
- Are they excited about change and new technology?
Appendix E - 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 40. 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**

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

**Primary drivers**

Will

**Secondary drivers**

Create an organisational culture and environment for improvement

**Interventions**

- Engage senior Leadership
- Make links to organisation goals
- Form teams
- Build skills
- Raise awareness
- Appoint clinical champions

Use the relevant content area ‘How to Guide’ to assess the latest evidence of best practise

Consult Faculty members to agree standards to be achieved

Use critical sub sets of key content areas to improve the outcome

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

PDSA cycles:

- Test
- Implement
- Spread
- Sustain

Establish reliable process

Use reliability model

**Execution Improvement Methodology (The how to)**

**Ideas Evidence Base (The what to)**
Reducing Healthcare Associated Infections

**Model for Improvement-PDSA Cycle**

1. What are we trying to accomplish?
2. How will we know that a change is an improvement?
3. What change can we make that will result in improvement?
4. Collect data
5. Analyse & present
6. Review measures
7. Repeat steps 4-6

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

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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 41 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 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><strong>Plot data over time</strong></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><strong>Seek usefulness, not perfection.</strong></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><strong>Use sampling.</strong></td>
<td>Sampling is a simple, efficient way to help a team understand how a system is performing.</td>
</tr>
<tr>
<td><strong>Integrate measurement into the daily routine.</strong></td>
<td>Useful data are often easy to obtain without relying on information systems.</td>
</tr>
<tr>
<td><strong>Use qualitative and quantitative data.</strong></td>
<td>In addition to collecting quantitative data, be sure to collect qualitative data, which often are easier to access and highly informative.</td>
</tr>
<tr>
<td><strong>Understand the variation that lives within your data.</strong></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.

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