The ‘How to Guide’ for Reducing Surgical Complications

Including post operative wound (surgical site) infections, adverse events and cardiovascular complications

Main contacts for Reducing Surgical Complications
Campaign Director: Jonathon Gray
Faculty Members: Hamish Laing & Mark Scriven
Content Specialist: Peggy Edwards
Other Contributors: Simon Noble (LifeBlood - The Thrombosis Charity)

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Reducing Surgical Complications

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**Interventions**

- Administer prophylactic antibiotic appropriately
- Use recommended hair removal
- Maintain glycaemic control for known diabetic patients
- Maintain peri-operative normothermia
- Use peri-operative briefings at beginning of list
- Implementation of the World Health Organisation (WHO) Surgical Safety Checklist
- Identify patients at risks, and provide appropriate DVT prophylaxis
- Continue beta blockers for patients admitted on beta blockers

**Measures:**

(ILI2 code included where appropriate to show overlap)

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<tr>
<td>(POP2) - Percent on-time prophylactic antibiotics administration</td>
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<td>(POP6) - Percent of inpatient surgical patients with appropriate hair removal</td>
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<td>(POP5) - Percent of appropriate surgical patients with perioperative normothermia</td>
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|阪开要件与使用每日团队简报包括核心团队
|Percentage completing the ‘time out’ section using Safer Surgery Checklist with the core team
|阪开手术患者的风险评估
|（POP1）- Percent of eligible surgical patients receiving DVT prophylaxis
|（POP4）- Percent of surgical patients on maintenance beta blockade who were continued on beta blockade

|Number of surgical patients who experience a DVT.

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Reducing Surgical Complications

Introduction
Surgery generally is very safe. However, there is the opportunity to improve further the system of care for surgical patients and experts have identified:

a) four ways to reduce the number of infections after surgery,

b) one key way further to improve team work

c) two approaches to prevent cardiovascular events

This guide introduces the interventions which the Campaign team propose will prevent surgical complications. These interventions and measures should be considered for adult patients undergoing elective surgical procedures in the hospital setting. This therefore does not include emergency procedures, outpatient surgical interventions or GP minor surgery. The aspiration is that by implementing these interventions it will prevent many surgical complications and help towards the goal of saving 1000 lives and reducing the harm to patients by 50,000. Trusts do not have to implement them all, or for all surgical patients. They might chose one or two interventions and concentrate on these. In fact we suggest that the team start very small, perhaps with one patient, one surgeon / anaesthetists or one list, see how that goes and then spread this to other teams and lists. All the time checking how it worked, did it make a difference and was it easy to do. Some of these interventions you may well be doing anyway, if so then an ongoing audit of compliance will be the only work the team will have to do.

This guide is separated into three sections, and can be used independently from each other:

Part A: Post Operative Wound (Surgical Site) Infections; with the four interventions which have been demonstrated to make a difference to the prevention of post operative wound (surgical site) infections.
Part B: Creating a Team Culture; where teams can raise safety concerns within the operating theatre.

Part C: Prevent Perioperative Cardiovascular Events; two interventions which will improve the cardiovascular outcome of the patient.

Each section gives examples of how the interventions can be implemented and what things should be measured to identify whether the trust can demonstrate at least 95% compliance in the patient populations they have identified.

This guide should be read with other papers provided by the Campaign e.g. Overall measures, improvement methodologies and other content areas.

NB The team should also ensure they consider the other Campaign area Improving Critical Care: Central Line Insertion Bundle, as this will influence the care of the patient in the anaesthetic room.
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Part A: Post Operative Wound (Surgical Site) Infection

Goal: Prevent 50% of post operative wound (surgical site) infections by implementing four components of care:

1. Appropriate use of antibiotics;
2. Use recommended hair removal methods;
3. Maintenance of glycaemic control for known diabetic surgical patients; and
4. Maintenance of postoperative normothermia for appropriate surgery patients.

The importance of preventing post operative wound (surgical site) infection

Post operative wound (surgical site) infections still occur and cause significant mortality and morbidity despite many advances in the surgical environment and techniques (Mangram 1999). It is estimated to occur in up to 15% of elective surgical patients and approximately 30% of patients whose surgical procedure was classed as contaminated or "dirty" (Bruce 2001). An audit of 247 hospitals in England over a period of six years (1997-2004) reported 7194 out of 239,953 patients having developed a post operative wound (surgical site) infection, giving an overall infection rate of around 3% (HPA 2006). Contaminated surgery accounted for 1890 infections in 19,099 of these patients (overall rate of 9.8%). The authors recognise that this rate is likely to be an underestimate as they only included infections detected prior to discharge. A recent UK wide prevalence study showed that post operative wound (surgical site) infection infections accounted for 19% of the healthcare associated infections in Wales (NPHS/WAG 2007).

The costs incurred when a patient contracts a post operative wound (surgical site) infection may be considerable in financial as well as social terms. It has been estimated that patients with post operative wound (surgical site) infection require, on average, an additional hospital stay of 6.5 days and that hospital costs are doubled. Extrapolating this to all acute hospitals in England gives an estimated additional annual cost of approximately £1 billion (Plowman 2000). NICE (2006) identified that an infection increases the cost by two to five times when compared to patients who suffer no infection, equating to between £1618 and £2398 per patient. Coello (2005)

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reported from earlier data in the Nosocomial Infection National Surveillance Service (NINSS) that the postoperative length of stay (LOS) was longer for patients with postoperative wound (surgical site) infection, and when adjusted for other factors influencing LOS, the extra LOS due to infections ranged from 3.3 days for abdominal hysterectomy to 21 days for limb amputation, and was at least nine days for the other categories. The additional cost attributable to post operative wound (surgical site) infection ranged from £959 for abdominal hysterectomy to £6103 for limb amputation.

There were 411,997 surgical procedures performed in Wales in 2006-2007. Using a conservative overall post operative wound (surgical site) infection wound infection rate of 3%, this represents over 12,000 infections. A less conservative estimate of a 15% infection rate represents nearly 61,800 infections.

Post operative wound (surgical site) infections were cited as the second most common type of adverse event occurring in hospitalized patients (Brennan 1991). Despite this the Centres for Disease Control and Prevention (CDC) have estimated that 40 to 60 percent of infections in clean elective surgery are preventable.

A review of the medical literature shows that the following care components reduce the incidence of surgical site infection: appropriate use of prophylactic antibiotics; appropriate hair removal methods; maintenance of perioperative glycaemic control for major cardiac surgery patients; and maintenance of perioperative normothermia for colorectal surgery patients. These components, if implemented reliably, could drastically reduce the incidence of surgical site infection in Wales, resulting in a significant reduction of preventable post operative wound (surgical site) infection.
General Considerations for improving post operative wound (surgical site) infection wound infection rates

Any improvement process should be driven by leadership, with a commitment to providing adequate resources and attention to the initiative. It is also imperative to involve a multidisciplinary / multi professional team in the surgical site infection improvement process. The team should use the IHI - “Model for Improvement” to conduct small-scale, rapid tests of the ideas for improvement over various conditions in a pilot surgical population.

<table>
<thead>
<tr>
<th>Example of Surgical Team</th>
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<tbody>
<tr>
<td>Areas of perioperative care management that pose particular safety risk include surgical infection prevention and perioperative cardio protection for high risk patients. A general surgery ward may be a good pilot unit to choose for your perioperative work. Your Front Line team may include:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>System Leader:</th>
<th>Surgery Division Chair/Clinical Director</th>
</tr>
</thead>
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<tr>
<td>Technical Expert:</td>
<td>Anaesthetist</td>
</tr>
<tr>
<td></td>
<td>General Surgeon</td>
</tr>
<tr>
<td></td>
<td>Charge Nurse, Operating Theatres / Senior</td>
</tr>
<tr>
<td></td>
<td>Operating Department Practitioner</td>
</tr>
<tr>
<td>Day-to-Day Leader:</td>
<td>Ward Sister, General Surgical Unit</td>
</tr>
</tbody>
</table>

Successful teams set clear aims for their work, establish base line measurements of performance, regularly measure and study the results of their work and test various processes and system changes over a variety of conditions in order to find the ones that lead to improvements in their particular setting. The role of the team will be to champion the interventions, offer practical support to the participating areas and review the measures to identify areas of improvements and support. They should also involve stakeholders including members of the infection control team, microbiology laboratory, risk managers, pre operative assessment teams and General Practitioners. An outline of the interventions across the patient pathway identifies how stakeholders are involved in the implementation of the interventions (appendix one).
Definition
The definition of a post operative wound (surgical site) infection can be difficult. For the purposes of this Campaign the Centers of Disease Control and Prevention (CDC) definition will be used:
“A surgical wound infection can be defined as the presence of pus and at least one of the following signs or symptoms: pain, localised swelling, redness or heat” (Mangram 1999).

First Test of Change
Teams may elect to work on any or all of the four care components: antibiotic use, hair removal, glucose control, and normothermia. A first test of change should involve a very small sample size (typically one patient) and should be described ahead of time in a Plan-Do-Study-Act format so that the team can easily predict what they think will happen, observe the results, learn from them, and continue to the next test.

Example: Administration of preoperative dose of antibiotic

The team decides to do a baseline measurement on the administration time of antibiotics in the anaesthetic room. They identify that contrary to common belief the antibiotics were not being given at the appropriate time. They identify an anaesthetist who supports the idea, and let the anaesthetist know that they will test this with one case. They then conduct the test. They note that the anaesthetist becomes frustrated because s/he cannot access the preoperative checklist used for documentation of administration time because it is in use by the circulating nurse. The team’s study of the data indicates that they should repeat this test, after first developing an alternative documentation location that will be accessible to the anaesthetist at the time of administration.

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Ideally, teams will conduct multiple small tests of change simultaneously across all four components of care. This simultaneous testing usually begins after the first few tests are completed and the team feels comfortable and confident in the process.

**Implementation and Spread**

For post operative wound (surgical site) infection, teams will usually choose to begin their improvement process by working with a “pilot” population. The pilot population might be hip and knee-replacement patients, for example, or patients undergoing major abdominal surgical procedures. It is possible to include all elective surgical patients in the pilot population, if that number is small (fewer than 50 cases per month). We recommend including at least 50 cases per month in the pilot population in order to increase the ability to measure and detect improvement.

In order to maximize the reduction in overall hospital mortality related to post operative wound (surgical site) infection, however, hospitals should ideally spread improvements begun in a pilot population to the whole surgical population during the two years of the Campaign. Organisations that successfully spread improvements use an organised, structured method in planning and implementing spread across populations, units, or facilities. More information about planning, tracking, and optimizing spread can be found at www.1000livescampaign.wales.nhs.uk. (See also IHI’s Innovation Series white paper, “A Framework for Spread: From Local Improvements to System-Wide Change,” downloadable for free at www.ihi.org)

**Barriers**

Teams working on preventing post operative wound (surgical site) infection have learned a great deal about barriers to improvement and how to face them. Some common challenges and solutions are:
1. Lack of support by leadership

*Solution:* Use opinion leaders (surgeons or anaesthetists) and data and if possible a business case for the project may help to win leadership support.

2. Uneven medical staff acceptance of new practices

*Solution:* Use opinion leaders, review the medical literature and feed back data at the level of individual surgeons and anaesthetists. It is important to identify surgeons and anaesthetists who have the characteristics of ‘early adopters’. Using their stories will help to persuade the more sceptical majority.

**Measures**

There is only one way to know if a change represents an improvement; measurement. Ultimately, the goal is to improve an outcome; teams accomplish this by first improving the processes that are the key determinants of that outcome. Therefore, it is important to track both process and outcome measures.

To assist with the understanding of the impact of post operative wound (surgical site) infection in your clinical areas, the overarching measure of post operative wound (surgical site) infection should be reported monthly and be the main measure for the organisation’s board internally and reported externally to the *extranet* reporting tool. In the reporting of these measures the distinction between superficial and deep infections will not be made. As your work progresses and you are ready for advanced measures on this topic, consider measures that address the different types of post operative wound (surgical site) infections as well as the other classes of wounds.

To aid the collection of data without increasing the burden on organisations a web-based tool is currently being developed by the Welsh Healthcare Associated Infection Programme (WHAIP) team and the informatics team of the National Public Health Service, which will require minimal information to be collated e.g. patients name and hospital number and notification of when an infection is identified. This simple

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A reporting tool will enable organisations to identify the denominator (the number of patients in the sample sub group) and the number of infections identified, giving an overall rate of infection for that sub group. It is anticipated that during the two year Campaign the measure will spread to include most major surgery undertaken in the organisation.

The process measures for each intervention will be explored in the intervention sections later. Some of these will be small daily measures of improvement taken in small area, and gathered every day, some will be audits of larger environments - but it will need to be whatever the team feels appropriate to drive the local improvement.

<table>
<thead>
<tr>
<th>Measure name:</th>
<th>% of surgical patients with SSI*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure type:</td>
<td>Outcome</td>
</tr>
<tr>
<td>Related content area / driver:</td>
<td>Reliable medicines</td>
</tr>
<tr>
<td>Description:</td>
<td>The percentage of surgical patients developing a Surgical Site Infection (SSI). Even though one patient could experience more than one SSI during the same admission or surgical procedure, this measure is a percentage not a rate. The numerator, therefore, is based on a simple question: Did the patient develop a SSI/? Yes or No? The measure is not concerned with how many the patient developed.</td>
</tr>
<tr>
<td>Rationale:</td>
<td>This is a measure of one aspect of the quality of care for patients undergoing surgery.</td>
</tr>
<tr>
<td>Numerator:</td>
<td>The total number of elective surgical patients in the sample who developed a SSIs.</td>
</tr>
<tr>
<td>Data Source:</td>
<td>Local Audit</td>
</tr>
<tr>
<td>Denominator:</td>
<td>The total number of surgical cases (patients) in the sample.</td>
</tr>
<tr>
<td>Data Source:</td>
<td>Local Audit</td>
</tr>
<tr>
<td>Method of calculation:</td>
<td>Calculate the actual percent of patients developing a SSI by dividing the numerator by the denominator and then multiplying the resulting proportion by 100.</td>
</tr>
<tr>
<td>Collection guidance:</td>
<td>Even though one patient could experience more than one SSI during the same admission or surgical procedure, this measure is a percentage not a rate. The numerator, therefore, is based on a simple question: Did the patient develop a SSI (Yes or No)? The measure is not concerned with how many...</td>
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Infections the patient developed. The decisions on sample size should be driven by surgical volumes. In order to have a viable percentage you want the denominator (number of surgical patients) to be at least 15-20 each month. If you fall short of this minimum, then you need to regroup and figure out what combination of areas and procedures you need in order to get this minimum denominator size.

Data on post-hospital-discharge infections are critical to accurate SSI data relating to the surgery we do hence the community has a crucial role in collecting SSI data for feeding back to the surgical teams in the hospital.

Run Charts

Improvement takes place over time and determining if improvement has really happened, and if it is sustained, requires the observation of patterns over time. Run charts are graphs of data against time and are one of the single most important tools in performance improvement.

Using run charts has a variety of benefits:

- They help improvement teams formulate aims by depicting how well (or poorly) a process is performing.
- They help in determining when changes are truly improvements by displaying a pattern of data that you can observe as you make changes.
- As you work on improvement, they provide information about the value of particular changes.

*mandatory measure

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Identification of infections
This is not without its challenge as many patients will not present to the organisation in which the surgery took place, when they develop a post-operative wound infection. For hospital clinical teams post-discharge surveillance is recognised to be difficult. There are a number of ways in which primary care can liaise with the Trust to notify them of post operative wound (surgical site) infection. For example, the use of the incident reporting process in primary care, via the National Patient Safety Agency eForm, where the GP can electronically share the report with the Trust and inform them of an infection (appendix one). Gwent Healthcare Trust has used a simple paper-based form included with the discharge summary: the GP can post back the form if an infection develops.
Preventing Surgical Site Infection:  
Four Components of Care

1. Appropriate Use of Prophylactic Antibiotics

For the purposes of the 1000 Lives Campaign, the antibiotic process measures are these (with a goal of 95% compliance):

1. Antibiotics within 1 hour before surgical incision*
2. Prophylactic antibiotic agent consistent with locally determined guidelines
3. Discontinuation of prophylactic antibiotics within 24 hours of surgery

*Due to the longer infusion time required for vancomycin, it is acceptable to start this antibiotic (e.g., when indicated because of beta-lactam allergy or high prevalence of MRSA) within 2 hours prior to incision.

Where Are We Now?

A medical record review of 34,133 prescription charts in the USA performed under the auspices of the Centers for Medicare & Medicaid Services (CMS) demonstrated that there is significant opportunity for improvement in post operative wound (surgical site) infection prevention (Bratzler 2005). In the area of appropriate antibiotic use, the medical record review found the following:

- Appropriate antibiotic selection occurred in 92.6% of cases;
- Antibiotics were given within one hour of incision time to 55.7% of patients; and
- Prophylactic antibiotics were discontinued within 24 hours of surgery end time for only 40.7% of patients.

What changes can we make that will result in improvement?

The United States have included these interventions in their 100,000 Lives Campaign. The have experience from hundreds of hospital teams across the United States that have developed and tested process and systems changes that allowed them to improve performance for prophylactic antibiotic use. Some of these changes are:

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• Use pre-printed or computerised standing orders specifying antibiotic agent, timing, dose, and discontinuation.
• Change operating room drug stocks to include only standard doses and standard drugs, reflecting national guidelines.
• Use visible reminders/checklists/stickers.
• Involve pharmacy, infection control, and infectious disease staff to ensure appropriate timing, selection, and duration.
• Verify administration time during “time-out” so action can be taken if not administered.

Consideration needs to be given to the inappropriate and excessive use of antibiotics as this leads to resistance. All trusts should have an antibiotic formulary; antibiotics should be placed in categories in order to restrict the availability of certain agents, including the use of prophylactic antibiotics during surgery. This intervention should be considered with the “Reducing Healthcare Associated Infections: Antibiotic Stewardship” campaign interventions.

Measure
The team needs to identify a sub group of patients to use as a pilot for this intervention. Using the PDSA cycle the team should use the process measures as a way of identifying a base line measure and improvement measure for this intervention. These measures are for the team to use internally within the organisation to identify improvements; they do not need to be reported either to the organisations board or the extranet. However they will wish to share them with their peers at the development events.
<table>
<thead>
<tr>
<th>Measure name:</th>
<th>% antibiotics administered on time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure type:</td>
<td>Process</td>
</tr>
<tr>
<td>Related content area / driver:</td>
<td>Prevent Post Operative Wound (Surgical Site) Infections In Elective Surgery</td>
</tr>
<tr>
<td>Description:</td>
<td>The percentage of elective patients receiving on-time prophylactic antibiotics administration.</td>
</tr>
<tr>
<td>Rationale:</td>
<td>This measure assesses whether units are complying with evidence-based practice. The implication is high compliance should reduce risk of infection.</td>
</tr>
<tr>
<td>Numerator:</td>
<td>The number of elective surgical patients with prophylactic antibiotics completely infused within 0-60 minutes prior to surgical incision (see exceptions listed) in your pilot population.</td>
</tr>
<tr>
<td>Data Source:</td>
<td>Local audit (Data collection tools or patients notes)</td>
</tr>
<tr>
<td>Denominator:</td>
<td>The total number of elective surgical patients in your pilot population during the month who should have received antibiotic prophylaxis.</td>
</tr>
<tr>
<td>Data Source:</td>
<td>Local audit (Data collection tools or patients notes)</td>
</tr>
<tr>
<td>Method of calculation:</td>
<td>Calculate the actual percent of eligible patients receiving antibiotic prophylaxis by dividing the numerator by the denominator and then multiplying by 100 resulting in a proportion.</td>
</tr>
<tr>
<td>Collection guidance:</td>
<td>This is a Yes/No question. Did the patient receive prophylactic antibiotics 0-60 minutes prior to surgical incision (see exceptions listed in the ‘How to Guide’). Create a system to track this measure prospectively in 100% of relevant pilot population. If antibiotic administered or time of recording is not documented, count this case as one in which the patient was not given the antibiotic on-time (i.e. count as error.</td>
</tr>
<tr>
<td></td>
<td>If you start measuring this in a pilot population, you will have to create a new data series in the Extranet every time you add another area to your surgical population.</td>
</tr>
<tr>
<td></td>
<td>Note: Organisations are likely to adapt antibiotic prophylaxis protocol(s) as part of their participation in the 1,000 lives campaign.</td>
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<table>
<thead>
<tr>
<th>Measure name:</th>
<th>% antibiotics discontinued early</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure type:</td>
<td>Process</td>
</tr>
<tr>
<td>Related content area / driver:</td>
<td>Prevent Post Operative Wound (Surgical Site) Infections In Elective Surgery</td>
</tr>
<tr>
<td>Description:</td>
<td>Percentage of elective patients whose prophylactic antibiotics were discontinued 24 hours (48 hours for CABG or other cardiac surgery) after the end of surgery.</td>
</tr>
<tr>
<td>Rationale:</td>
<td>This measure assesses whether units are complying with evidence-based practice. The implication is high compliance should reduce risk of infection and reduce the risk of antibiotic resistance.</td>
</tr>
<tr>
<td>Numerator:</td>
<td>The total number of elective surgical patients whose prophylactic antibiotics were discontinued within 24 hours of the end of surgery (48 hours for CABG or other cardiac surgery) in your pilot population.</td>
</tr>
<tr>
<td>Data Source:</td>
<td>Local audit (Data collection tools or patients notes)</td>
</tr>
<tr>
<td>Denominator:</td>
<td>The total number of elective surgical patients with no evidence of existing pre-operative infection in your pilot population during the month.</td>
</tr>
<tr>
<td>Data Source:</td>
<td>Local audit (Data collection tools or patients notes)</td>
</tr>
<tr>
<td>Method of calculation:</td>
<td>Calculate the actual percent of patients whose antibiotics were discontinued by dividing the numerator by the denominator and then multiplying the resulting proportion by 100.</td>
</tr>
<tr>
<td>Collection guidance:</td>
<td>This is a Yes/No question. Were the antibiotics discontinued within 24 hours of the end of surgery? NB Patients in whom antibiotics is continued as treatment should be excluded from this measure. Create a system to track this measure prospectively in 100% of relevant pilot population. Summarise and report every month on the Extranet. If you start measuring this in a pilot population, you will have to create a new data series in the Extranet every time you add another area to your surgical population.</td>
</tr>
</tbody>
</table>

Exceptions:
- within two hours if patient receiving vancomycin,
- If surgery is being carried out with tourniquet control, all antibiotic administration must be completed before the tourniquet is inflated and within one hour prior to surgical incision.

- Women undergoing caesarean section should receive the antibiotic as soon as the umbilical cord is clamped.
2. Use Recommended Hair Removal Methods

Evidence suggests that the rate of post operative wound (surgical site) infection is not influenced by whether hair removal is undertaken or not. If hair is to be removed the method of doing so can affect the post operative surgical infection rate. The limited evidence from a systematic review suggest that the use of electric shavers (clippers) compared to shaving with a razor, reduces the incidents of post operative wound (surgical site) infection (Tanner et al 2006).

For the purposes of the 1000 Lives Campaign, the appropriate hair removal method is:
1. Only electric shavers to be used to remove hair at the site of incision.

What changes can we make that will result in improvement?
Hundreds of hospital teams across the United States have developed and tested process and systems changes that allowed them to improve performance on the appropriate hair removal measure. Some of these changes are:

- Ensure adequate supply of electric shavers and train staff in proper use.
- Use reminders (signs, posters).
- Educate patients not to self-shave preoperatively.
- Remove all razors from the entire hospital (accept for men who wish to shave their faces.
- Work with the purchasing department so that razors are supplied only to those appropriate areas.

Measure
The team needs to identify a sub group of patients to use as a pilot for this intervention. Using the PDSA cycle the team should use the process measures as a way of identifying a base line measure and improvement measure for this intervention. These measures are for the team to use internally within the organisation to identify improvements; they do not need to be reported either to the organisations board or
However, they will wish to share them with their peers at the development events.

Many teams working on this measure find that the use of razors in their own institutions can range from zero to nearly one hundred percent. It is generally recommended that any preoperative hair removal not occur in the operating room itself, as loose hairs are difficult to control. We recommend collecting baseline information on this measure in order to determine current practice.

<table>
<thead>
<tr>
<th>Measure name: % surgery with appropriate hair removal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure type: Process</td>
</tr>
<tr>
<td>Related content area / driver: Prevent Post Operative Wound (Surgical Site) Infections In Elective Surgery</td>
</tr>
<tr>
<td>Description: The percentage of inpatient elective surgical patients with hair removal by an approved method.</td>
</tr>
<tr>
<td>Rationale: This measure assesses whether units are complying with evidence based practice. The implication is that high compliance should reduce the risk of developing a surgical site infection.</td>
</tr>
<tr>
<td>Numerator: The total number of elective surgical patients with surgical site hair removal by an approved method in your pilot population.</td>
</tr>
<tr>
<td>Data Source: Local audit</td>
</tr>
<tr>
<td>Denominator: The total number of elective surgical patients in your pilot population.</td>
</tr>
<tr>
<td>Data Source: Local audit</td>
</tr>
<tr>
<td>Method of calculation: Calculate the actual percent elective surgical patients with appropriate hair removal by dividing the numerator by the denominator and then multiplying the resulting proportion by 100.</td>
</tr>
<tr>
<td>Collection guidance: Consult the How To Guide for advice on what constitutes appropriate hair removal. Depending on the volume of elective surgical patients seen each week, this measure may be based on a total enumeration of surgical patients or sample. Each month 15-20 surgical cases should be reviewed. If there is a large volume of surgical cases each week (e.g., over 50) stratification could be considered.</td>
</tr>
</tbody>
</table>

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| If you start measuring this in a pilot population, you will have to create a new data series in the Extranet every time you add another area to your surgical population. |
3. Maintenance of Peri-operative Glycaemic Control*

Review of medical literature shows that the degree of hyperglycaemia in the peri-operative period is correlated with the rate of post operative wound (surgical site) infection in patients undergoing major cardiac surgery (Latham 2001, Dellinger 2001, Furnary and Wu 2006, Lazar et al. 2004). There are only two Randomised Controlled Trials (RCT) reported in this area but there are also a number of other case controlled studies as well as retrospective records reviews and analysis of national databases.

Collating all this information suggests that a wider group of surgical patients could benefit from tight glycaemic control in the peri-operative period.

*NOTE that, for the purposes of this Campaign, the desired range is being defined as a serum glucose level between 5-10 mmol/L, throughout peri-operative period.

Goal: To ensure that 95% of adult diabetic, elective surgical patients have a peri-operative blood sugar between 5-10 mmol/L.

1. All diabetic patients (whether insulin or tablet controlled) should have capillary glucose monitoring instituted at a minimum frequency of 4 hourly prior to transfer to the operating theatre, immediately pre-operatively, hourly during surgery and until discharge from recovery and/or infused regime is stable; and then 2-4 hourly until normal feeding is resumed.

2. All patients should be treated, according to local protocols, to maintain a blood glucose level between 5-10 mmol/L.

Although there is some evidence that even tighter levels of glycaemic control can influence post operative surgical site infections, this must be balanced against the risk of inducing hypoglycaemia. As most diabetic surgical patients will be nursed outside of a critical care setting, a range of 5-10 mmol/L reduces the risk of hypoglycaemia.

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What changes can we make that will result in improvement?
Hospital teams across the UK are developing and testing process and system changes to improve performance for the peri-operative glucose control measure. These include:

- Have a reliable system to identify all diabetic patients in pre-assessment and ensure that their surgery is scheduled for as early in the day as possible, e.g. first on the list.
- Have a policy guiding the allocation of diabetic patients to early morning surgery, including the early feeding and commencement of normal insulin therapy if not remaining Nil By Mouth after surgery.
- Have patients manage their own insulin as soon as they are capable.
- All diabetic patients should have their diabetes management reviewed to ensure desired glycaemic control is attained (see above).
- Regularly check preoperative blood glucose levels on all diabetic patients to identify hyperglycaemia & hypoglycaemia; this is best done early enough that assessment of risk can be completed and treatment initiated if appropriate.
- Develop and implement one glucose control protocol to be used for all surgical patients which identifies and manages all patients with diabetes, including triggers to instigate IV protocols in starved patients and step down to sub cutaneous (SC) regimes.
- Eliminate the use of SC sliding insulin dosage scales; if a sliding scale is used, standardize it through the use of a protocol and pre-printed or computer generated prescription chart, which clearly designates the specific increments of insulin coverage.
- Require an independent double-check of the drug, concentration, dose, pump settings, route of administration, and patient identity before administering all IV insulin.
- Use pre-typed diabetic and insulin infusion orders with “units” written in full.
- Use a diabetic management flow sheet.
- Separate look-alikes and sound-alikes by labelling, by time, and by distance, unless standardising to a single preparation / product.

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• Prepare all infusions in the pharmacy and standardize to a single concentration of IV-infusion insulin.

• Assign responsibility and accountability for blood glucose monitoring and control and actioning the results.

The recent guidelines produced by The All Wales Consensus Group to support the NSF for Diabetes in Wales has suggested regimens. The following are an adaptation of those:

**For patients on oral hypoglycaemic agents:**

**Day of surgery**

- Monitor blood glucose hourly

**Minor Surgery**

- If fasting blood glucose <8 mmol/L then no insulin, only normal saline
- If fasting blood glucose >8 mmol/L treat as for insulin treated patients

**Major surgery**

- Treat as for insulin treated patients

**Post operative**

- Check blood glucose every 2-4 hours
- Continue insulin / dextrose / saline infusion if used peri-operatively
- Recomence oral hypoglycaemics as protocol dictates

**For patients on insulin**

**Day of Surgery**

- No subcutaneous insulin (patient should be on morning list)
- Start 5% insulin / dextrose / potassium infusion one hour before surgery (1l dextrose 5% with potassium chloride added (pre-mixed))
- Before connecting to the patient run 25ml through giving set
- A syringe pump with 50 units insulin diluted to 50 mls with normal saline and an infusion rate adjusted to deliver the required units / hour. The giving set should have an anti-siphon valve in-line. The patient should also receive 5%

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dextrose infusion, either through a separate cannula or through the same cannula ensuring a non return valve prevents the insulin infusion mixing with the dextrose.

- Monitor blood glucose every hour and at the end of surgery. Adjust insulin to achieve the desired range 5-10 mmol/l.

**Post operative**

- Check blood glucose every 2-4 hours (on ward, hourly in recovery)
- Continue IV insulin / dextrose / saline infusion until oral feeding resumed. If this is a number of days regular U&Es should be taken and IV fluids should address any salt imbalances.

*Further examples of protocols in use can be found in the extranet workgroup resources.*

**Insulin Therapy**

This guide should be considered in conjunction with the Medicine Management “How to Guide” for Secondary Care. Therefore a clinical pharmacist with responsibility for operating theatres / post surgical wards or the lead responsible for the Medicines Management content area should form part of the intervention team.

Insulins are effectively used to treat diabetics and elevated blood sugars in post-operative patients. The goal of therapy is to achieve control without causing the immediate harm associated with hypoglycaemia or long-term harm associated with hyperglycaemia. The pharmacology of the drug, complexity of dosing, and variety of products all contribute to the potential for error and associated harm. The following are specific to this intervention area and are a number of suggested strategies can decrease errors and related harm.

1. Undertake a risk assessment of insulin procedures and products in all clinical areas to identify high risks, and develop an action plan to minimise them.
2. Ensure there are up-to-date protocols and procedures for prescribing, preparing and administering insulin in all clinical areas.

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3 Ensure essential technical information on insulin is available and accessible to healthcare staff in clinical areas at the point of use.

4 Provide training for, and supervision of, all healthcare staff involved in prescribing, administering and monitoring insulin therapy.

**PDSA Cycles**

As there are not always diabetic patients on every list, a slightly different approach is needed with this intervention. Links with pre-assessment clinics need to be established as there is an opportunity to do PDSA cycles on every patient, as there is time to get sufficient notice from pre-assessment team that a diabetic patient is on the list (appendix one). For example you could test the practicality of getting pharmacy to make up syringes, or testing whether instigating treatment on the ward is as practical as this being undertaken in the operating theatre, or identifying syringe drivers in advance, or to ensure consistency of equipment etc.

A spread plan for this intervention area might look like this:

<table>
<thead>
<tr>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar</td>
<td>Apr</td>
</tr>
<tr>
<td>Action Period 3</td>
<td>Action Period 4</td>
</tr>
<tr>
<td>Testing &amp; implementing</td>
<td>Implementing, planning</td>
</tr>
<tr>
<td>spread &amp; spreading</td>
<td>spread</td>
</tr>
</tbody>
</table>

**Measure**

The team need to identify a sub-group of patients which they are going to use as a pilot for this intervention. Since the best evidence for glucose control as a strategy to reduce post operative wound (surgical site) infection is in the cardiovascular surgery population, it would be sensible for Trusts who perform this type of surgery to focus on this high-risk population. Other areas to be considered include patients who will be

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NBM in the immediate post operative period and who are at high risk of developing SSIs, e.g. colorectal surgery patients.

Using the PDSA cycle, the team should use the process measures as a way of identifying a base line measure and an improvement measure for this intervention. These measures are for the team to use within the organisation to identify improvements; they do not need to be reported either to the organisations board or the extranet. However they may wish to share them with peers at the development events.
<table>
<thead>
<tr>
<th>Measure name:</th>
<th>% diabetic patients with good glucose control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure type:</td>
<td>Process</td>
</tr>
<tr>
<td>Related content area / driver:</td>
<td>Prevent Post Operative Wound (Surgical Site) Infections In Elective Surgery</td>
</tr>
<tr>
<td>Description:</td>
<td>The percentage of known diabetic elective surgical patients with controlled serum glucose (5-10 mmol/L) immediately post operatively.</td>
</tr>
<tr>
<td>Rationale:</td>
<td>This measure assesses whether units are complying with a small evidence-base. The implication is that high compliance should reduce risk of infection</td>
</tr>
<tr>
<td>Numerator:</td>
<td>The number of elective diabetic surgical patients with controlled serum glucose (5-10 mmol/L) in the immediate post-operative period i.e. in recovery room.</td>
</tr>
<tr>
<td>Data Source:</td>
<td>Local Audit</td>
</tr>
<tr>
<td>Denominator:</td>
<td>The total number of diabetic elective surgical patients in your pilot population.</td>
</tr>
<tr>
<td>Data Source:</td>
<td>Local Audit</td>
</tr>
<tr>
<td>Method of calculation:</td>
<td>Calculate the actual percent of diabetic surgical patients with postoperative glucose control by dividing the numerator by the denominator and then multiplying the resulting proportion by 100</td>
</tr>
<tr>
<td>Collection guidance:</td>
<td>Create a system to track this measure prospectively in 100% of the surgical patients in the relevant pilot population. If you start measuring this in a pilot population, you will have to create a new data series in the Extranet every time you add another area to your surgical population.</td>
</tr>
</tbody>
</table>

Although this measure only considers the immediate post-operative period, teams may wish to audit for the first three days post-operatively as a custom measure on the extranet (please refer to your local data collector).

Experience from the Safer Patient Initiative (SPI) sites has demonstrated that this intervention is difficult to achieve, especially in the short term. Therefore teams may want also to collect information on the range of blood sugar level as well as a simple “yes / no” response of ‘glucose control’ to establish just how far the processes are.

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from being reliable e.g. did the patients having blood glucose level of 0.5 mmols/L above the range as opposed to 2 mmols/L above the range.
4. Maintenance of Intra Operative Normothermia

Recently released NICE guidance reinforces the evidence that maintaining normothermia for surgical patients is imperative (NICE 2008). It is not unusual for a patient’s core temperature to drop below 36.0°C following induction of general or regional anaesthesia. If the perioperative team do not manage this risk throughout the perioperative patient pathway, as many as 70% of patients undergoing routine surgery may be hypothermic on admission to the recovery room. In Wales this could mean nearly 290,000 patients per year (HSW 2007). The main reasons for hypothermia include the loss, under general or regional anaesthesia, of the behavioural response to cold and the impairment of thermoregulatory heat-preserving mechanisms and anaesthetic-induced peripheral vasodilation (with associated heat loss). Additional factors that increase the risk of hypothermia include the use of un-warmed blood and intravenous or irrigation solutions, and environmental factors such as a lower theatre temperature. It is also sensible to prevent patients getting cold while waiting or being transported for surgery, exposing the body during surgery and, avoiding fluid deprivation before anaesthesia.

If hypothermia does develop then patients can experience increased perioperative blood loss, longer post-anaesthetic recovery, postoperative shivering and thermal discomfort, increased risk of morbid cardiac events including arrhythmia, altered drug metabolism, increased risk of wound infection, reduced patient satisfaction with the surgical experience and a longer stay in hospital.

There are several systematic reviews of the literature concerning the effects and prevention of hypothermia (NICE 2008 and Scott & Buckland 2006). The medical literature indicates specifically that patients undergoing elective hernia repair, varicose vein surgery, or breast surgery and colorectal surgery have a decreased risk of post operative wound (surgical site) infection if they are warmed during the perioperative period (Melling 2001 and Kurz et al 1996). Whilst some experts believe that initial efforts should be directed at colorectal surgery patients due to their

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increased risk of post operative (surgical site) infection, until additional clinical studies are performed, there is evidence to show that preventing hypothermia in all patients considered at risk is beneficial in reducing other complications.

*NOTE that this component of care does not pertain to those patients for whom therapeutic hypothermia is being used (e.g., hypothermic cardioplegia).

For the purposes of the 1000 Lives Campaign, the normothermia interventions are these:

1. Patients are risk assessed for the potential to develop inadvertent hypothermia during surgery and their risk of cardiovascular complications (documented).
2. Patients with a core temperature of less than 36.0°C pre operatively do not commence their anaesthesia and surgery until they have been warmed to at least 36.0°C using forced warm air. Active warming should then continue throughout the procedure.
3. All patients at higher risk and / or with surgery anticipated to last or more than 30 minutes, are warmed intra operatively using forced warm air.*
4. All patients routinely have their temperature monitored; in the hour before surgery, before induction, every 30 minutes during surgery, on arrival in the recovery room and every 15 minutes during the recovery period.
5. Healthcare professionals should ensure that intravenous fluids (500 ml or more) and blood products are warmed to 37°C using an appropriate fluid warming device.
6. Patients who arrive in recovery with a temperature less than 36.0°C should be warmed using forced warm air and transfer to the ward should not be arranged until their temperature is 36.0°C or above.

* If this is not a practical intervention e.g. exposed surface area too extensive to allow forced warm air, then an alternative form of warming needs to be considered. There is an extensive range of products on the market which could be used for most surgery
What changes can we make that will result in improvement?
NICE 65 guidance was released in April 2008. The Campaign endorses the actions proposed by NICE. The following is not solely based upon the NICE guidance.

This intervention includes action across the whole surgical pathway (appendix one). In the perioperative period, ideally during the patient’s pre operative assessment appointments, patients who have two or more of the following risks should be identified as being at higher risk of developing hypothermia and its complications perioperatively:

- ASA grade II to V (the higher the grade, the greater the risk)
- Likely to undergo combined general and regional anaesthesia
- undergoing major or intermediate surgery
- at risk of cardiovascular complications.

(NICE 2008)

In order to ensure patients do not lose heat prior to or during the transfer to the theatre department, they should be encouraged to wear their own warm normal clothing, bed clothing, dressing gowns and slippers for as long as possible. Ideally patients should walk to theatre covered with a dressing gown and wearing slippers. Where patients are transferred on trolleys, then they should be covered with one cotton sheet and two blankets, or alternatively a duvet.

In addition to the interventions above, to ensure other environmental factors are not detrimental to the maintenance of normothermia, the theatre temperature should be set at 21°C whilst the patient is exposed, and the patient should be covered for as long as possible. This temperature setting could be turned down as soon as forced air...
warming is established. If however the team members are uncomfortably warm then active cooling clothing is available to purchase.

It is also important to ensure that healthcare professionals are trained in the use any temperature recording or warming device. They should also be aware of, and carry out, any adjustments that need to be made in order to obtain an estimate of core temperature from that recorded at the site of measurement and be aware of any such adjustments that are made automatically by the device used.

A phased approach to this issue may be the way teams wish to take this intervention forward. The requirement to have a policy on the prevention of inadvertent hypothermia has been in place for several years (Welsh Risk Management Standards). Trusts may find that undertaking a base line assessment of the incidence of hypothermia in recovery as a starting point, to identify which population of patients they should concentrate on first.

**Measure**

The team need to identify a sub group of patients which they are going to use as a pilot for this intervention. Using the PDSA cycle the team should use the process measures as a way of identifying as base line measure and improvement measure for this intervention. These measures are for the team to use internally within the organisation to identify improvements; they do not need to be reported either to the organisations board or the extranet. However they will wish to share them with their peers at the development events.

Many teams are already routinely measuring patients’ temperature on arrival into recovery. We recommend collecting baseline information on this measure in order to determine current practice.

Local feedback is important to identify areas of weakness and success. This intervention lends itself to a particular type of measure - “the number of patients between incidents of hypothermia (i.e. patients who arrive at recovery with a

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temperature less than $36.0^\circ C$). This can be displayed locally and collated over time to identify an increase in the amount of time lapsed between events.

<table>
<thead>
<tr>
<th>Measure name:</th>
<th>% with perioperative normothermia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure type:</td>
<td>Process</td>
</tr>
<tr>
<td>Related content area / driver:</td>
<td>Prevent Post Operative Wound (Surgical Site) Infections In Elective Surgery</td>
</tr>
<tr>
<td>Description:</td>
<td>The percentage of appropriate elective surgical patients with a body temperature of greater than $36.0$ degrees Centigrade immediately following surgery.</td>
</tr>
<tr>
<td>Rationale:</td>
<td>This measure assesses whether units are complying with agreed guidance. The implication is that high compliance should reduce the risk of developing a Surgical Site Infection</td>
</tr>
<tr>
<td>Numerator:</td>
<td>The number of appropriate elective surgical patients with a body temperature of greater than $36.0$ degrees Centigrade immediately following surgery.</td>
</tr>
<tr>
<td>Data Source:</td>
<td>Local Audit</td>
</tr>
<tr>
<td>Denominator:</td>
<td>The total number of surgical patients not excluded from normothermic maintenance in your pilot population.</td>
</tr>
<tr>
<td>Data Source:</td>
<td>Local Audit</td>
</tr>
<tr>
<td>Method of calculation:</td>
<td>Calculate the actual percent of eligible surgical patients with perioperative normothermia by dividing the numerator by the denominator and then multiplying the resulting proportion by 100</td>
</tr>
<tr>
<td>Collection guidance:</td>
<td>Create a system to track this measure prospectively in $100%$ of the surgical patients in the pilot population. Temperature readings should be record immediately upon leaving the operating theatre. Normothermia = temperature of greater than $36.0$ degree Centigrade. Exclusion criteria: Patients for whom hypothermia is deliberately sought for therapeutic reasons (e.g. hypothermic total circulatory arrest). If you start measuring this in a pilot population, you will have to create a new data series in the Extranet every time you add another area to your surgical population.</td>
</tr>
</tbody>
</table>

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An issue needed to be considered when collecting this measure is the method used to capture the temperature (e.g. tympanic, oral, auxiliary or rectal etc.). The key point is consistency, as long as the same measure is used over time, then comparisons in data can be made.

Incident reporting should also be used to report any cases of post operative hypothermia. The number of incident reports over time could be used internally as a measure.

Further information on suppliers and ordering details of products from Welsh Health Supplies will be available via the surgical complications content area on the extranet.
Part B: Create team culture

1. Use team briefing at beginning of each operating list

Team briefings are a simple way for the operating team to share information about potential safety problems and concerns about patients on that operating list. The briefing should foster an environment in which the team can share information without fear of reprisal and integrate the reporting of safety issues into everyday work. They also allow the whole theatre team to anticipate potential problems or challenges. The idea is that the briefing is just that brief, and should only take about five minutes occurring at the beginning of the operating list. Observational studies have identified that using a structured team brief reduced the number of communication failures and promoted proactive and collaborative team communication (Lingard et al 2007) and even though there is scepticism from some surgeons those who did participate felt that it had a positive impact (Allard 2007).

What changes can we make that will result in improvement?

Some of the ways in which team briefings can be developed are:

- Allocating five minutes before the start of the operating list where the core members of the team e.g. surgeon, scrub nurse, circulating nurse, ODP and anaesthetist can meet to discuss the requirements of that operating list and any safety concerns.
- Identify in advance a list of safety issues for discussion e.g. patient allergies, anticipated complications etc., potentially using a structured checklist.
- Using a de-briefing session at the end of the operating list to review any issues raised, answer concerns or discuss incidents.

Measure

The team need to identify operating lists which they are going to use as a pilot for this intervention. Using the PDSA cycle the team should use the process measures as a way of identifying base line and improvement. These measures are for the team to use

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internally within the organisation to identify improvements; they do not need to be reported either to the organisation’s board or the extranet. However, they will wish to share them with their peers at the development events.

<table>
<thead>
<tr>
<th>Measure name:</th>
<th>% daily team briefings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure type:</td>
<td>Process</td>
</tr>
<tr>
<td>Related content area / driver:</td>
<td>Create a team culture attuned to detecting and rectifying data intra operative errors</td>
</tr>
<tr>
<td>Description:</td>
<td>The percentage of operating days in the month in which at least one team briefing, including the core team, was conducted per theatre list.</td>
</tr>
<tr>
<td>Rationale:</td>
<td>The implication is that increased daily team briefings including the core team will create a team culture for detecting errors and rectifying data intra operative errors.</td>
</tr>
<tr>
<td>Numerator:</td>
<td>The total number of number of days in the month in which at least one team briefing was conducted per theatre list in your pilot population.</td>
</tr>
<tr>
<td>Data Source:</td>
<td>Local Audit</td>
</tr>
<tr>
<td>Denominator:</td>
<td>The total number of operating days in the month in your pilot population.</td>
</tr>
<tr>
<td>Data Source:</td>
<td>Local Audit</td>
</tr>
<tr>
<td>Method of calculation:</td>
<td>Calculate the percent compliance with using team briefings by dividing the numerators by the denominator and then multiplying the resulting proportion by 100.</td>
</tr>
<tr>
<td>Collection guidance:</td>
<td>Create a system to track this measure prospectively in 100% of relevant pilot population.</td>
</tr>
<tr>
<td></td>
<td>If you start measuring this in a pilot population, you will have to create a new data series in the Extranet every time you add another area to your surgical population.</td>
</tr>
</tbody>
</table>

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Website: [www.1000livescampaign.wales.nhs.uk](http://www.1000livescampaign.wales.nhs.uk)
2. Implementation of the WHO Safer Surgery Checklist

The 1000 Lives Campaign has included a requirement to have team briefings at the beginning of the operating list as a simple way for the operating team to share information about potential safety problems and concerns about patients on that operating list. The idea is that these briefings should foster an environment in which the team can share information without fear of reprisal and integrate the reporting of safety issues into everyday work. They also allow the whole theatre team to anticipate potential problems or challenges.

The “Safer Surgery Checklist”, including the Time Out, integral to the checklist, provides opportunity for the whole theatre team to share information about potential safety problems and concerns about specific patients on the operating list. It facilitates the integration of essential reporting on safety issues into everyday work. This proactive information exchange also enables the whole theatre team to anticipate potential problems or challenges.

A copy of the checklist can be found in below.


A Starter Kit has also been developed by WHO to assist pilot sites in implementing the checklist. This can be found at [www.patientsafetyfirst.nhs.uk](http://www.patientsafetyfirst.nhs.uk). A UK version will be available soon.

There is also an opportunity to hear the author, Dr Atul Gawande, speak about the tools development and use in practice on the IHI web site ([http://www.ihi.org/IHI/Programs/Campaign/Campaign.htm?TabId=7](http://www.ihi.org/IHI/Programs/Campaign/Campaign.htm?TabId=7)). If you would like to view a short film about the checklist please go to [http://www.safesurg.org/index.html](http://www.safesurg.org/index.html)
**What can we do locally that will result in improvement?**

The checklist was designed for international use so there may be some items that are already accepted or essential practice in the UK. The WHO Surgical Safety Checklist, which can be adapted to accommodate additional local requirements, brings together existing best practice for safety checks in theatres and supports correct site surgery. The NPSA has already adapted the US version to set some UK context but local organisations may wish to enhance this further, although the checklist should not be shortened.

There may be some things on the list that you do not need to do at the start of every case. For example if you enjoy consistency in team members and are assured that everyone knows ‘who is who’ in the theatre, you should not need to do this again during the list unless there is a change in team members.

It is recognised that there may be some rare emergency situations where stopping to use the checklist may not be appropriate. On these occasions, the team need to exercise their clinical judgement as to whether the risk of a short delay overrides the risks of omitting the checks (bearing in mind the increased likelihood of error in high pressure/ stressful situations).

**Using the PDSA cycle**

Like all the other interventions in the campaign using the “model of improvement” will improve reliable implementation; start with one patient, one surgeon / anaesthetists or one list, see how that goes and then spread this to other teams and lists, all the time checking how it worked, did it make a difference and was it easy to do.

- Identify one consultant who is happy to test using the checklist
- Identify one patient on one list with whom you will test out using the checklist
- Use all 3 parts of the checklist during that case - “**Sign In**”, “**Time Out**”, “**Sign Out**”
- At an appropriate point in the day talk to each of the core team members involved about how ‘user friendly’ each of the parts of the checklist were. Ideally gather the
whole team together during a break in/at the end of the list so that everyone can hear the issues raised by other members of the team
• Discuss the following: the content of each section - is there anything the team would like to see added? How long did it take? Did it pick up any ‘glitches’? How could we make the form or the process better next time?
• Make refinements based on the discussion. If the refinements may take time to implement such as creating a new form, arrange to do this but agree how you could carry on the testing in its current state perhaps by handwriting in an additional check for the next few test cycles
• Test again. Making refinements as you go until you can do this successfully for the whole list
• Now test with another surgeon’s list. It may help if the first consultant identifies and discusses the checklist with a willing colleague.

*It is important to note that whilst selecting one consultant surgeon and anaesthetist to use the checklist is helpful in the testing phase, it is not a purely consultant led process. All members of the team should become comfortable using the checklist if it is to improve team-working and empower them to challenge should the need arise.*

The IHI Open School has a student chapter which includes students at Cardiff University. The medical and nursing students are very keen to support the implementation of the Safer Surgery checklist and are willing to help with data collection and also taking part in the practical application of the checklist such as prompting the surgical team by verbalising all the points on the checklist.

As teams have developed experience using the model for improvement over the last 12 months there is an opportunity rapidly to introduce this new intervention into practice. IHI have set a challenge to organisations that this intervention could be rapidly tested and embedded into one team in one theatre within 90 days. By using the PDSA cycle in rapid succession e.g. one test per patient on the list then rapid tests of change can be undertaken. Quick checks at the end of each case and plans for the next case can result in several tests of change in one list. Starting again as soon as the
next opportunity arises e.g. the next operating session with a surgical champion can build momentum and increase the speed of change and implementation. By collating the PDSAs any changes that the checklist required or development of the process can be shared when planning spread. Examples can be found in appendix two.

The NPSA alert has a 12 month implementation period, which would coincide with the end of the 1000 Lives Campaign in early 2010. Therefore a spread plan should look something similar to this:

<table>
<thead>
<tr>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>Jan</td>
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<tr>
<td>Feb</td>
<td>Feb</td>
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<td>Mar</td>
<td>Mar</td>
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<td>Apr</td>
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<td>May</td>
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<td>Jun</td>
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<td>Jul</td>
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<td>Sep</td>
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<td>Nov</td>
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<td>Dec</td>
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<td>Jan</td>
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<td>Feb</td>
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<td>Mar</td>
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<td>Apr</td>
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</tr>
<tr>
<td>May</td>
<td>May</td>
</tr>
<tr>
<td>Jun</td>
<td>Jun</td>
</tr>
</tbody>
</table>

**Action Period 3** | **Action Period 4**

- **Testing & implementing**
- **Implementing, planning spread & spreading**
- **Planning spread**
- **Spreading**

**Testing:** *Using PDSA cycles to test out an intervention in a pilot population*

The terms used in the campaign are defined as follows:

“Implementing”: *Making the tested intervention part of everyday life within the whole pilot population and monitoring to ensure it is sustainable and reliable. Make further amendments as necessary.*

“Planning to spread”: *Performing the necessary actions to identify and prepare subsequent populations to test and implement the intervention.*

“Spreading”: *Testing and implementing the intervention in all relevant populations.*
Measure
The team need to identify operating lists which they are going to use as a pilot for this intervention. Using the PDSA cycle the team should use the process measures as a way of identifying base line and improvement.

Teams may wish to use a bespoke record sheet in the theatre to identify the patients where the checklist was used, with one person having ownership of the intervention and records it daily. The mandatory minimal measure for this intervention is;

<table>
<thead>
<tr>
<th>Measure name:</th>
<th>% completing the ‘time out’ section using Safer Surgery Checklist with the core team</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure type:</td>
<td>Process</td>
</tr>
<tr>
<td>Description:</td>
<td>The percentage of elective surgical patients in the month which completed the ‘time out’ used the safer surgery checklist, including the core team.</td>
</tr>
<tr>
<td>Numerator:</td>
<td>The total number of number of elective surgical patients in the month which completed the ‘time out’ the safer surgery checklist was used in your pilot population.</td>
</tr>
<tr>
<td>Data Source:</td>
<td>Local Audit</td>
</tr>
<tr>
<td>Denominator:</td>
<td>The total number of elective surgical patients in the month in your pilot population.</td>
</tr>
<tr>
<td>Data Source:</td>
<td>Local Audit</td>
</tr>
<tr>
<td>Method of calculation:</td>
<td>Calculate the percent compliance completing the ‘time out’ using the checklist by dividing the numerators by the denominator and then multiplying the resulting proportion by 100.</td>
</tr>
<tr>
<td>Collection guidance:</td>
<td>Create a system to track this measure prospectively in 100% of relevant pilot population.</td>
</tr>
</tbody>
</table>

This is a **mandatory** measure for the surgical complications content area and should be reported to the extranet on a monthly basis from April 2009. Any other measures developed are for the team to use internally within the organisation to identify

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improvements; they do not need to be reported either to the organisations board or the extranet. However the model for improvement methodology is based on measuring reliability of implementation and spread, therefore recording the use of the checklist on the extranet gives teams an opportunity to track and demonstrate progress.
WHO Surgical Safety Checklist
(adapted for England and Wales)

SIGN IN (To be read out loud)
Before Induction of anaesthesia

- Has the patient confirmed his/her identity, site, procedure and consent?
  - Yes
  - No

- Is the surgical site marked?
  - Yes
  - No

- Is the anaesthesia machine and medication check complete?
  - Yes
  - No

- Does the patient have a:
  - Known allergy?
    - Yes
    - No
  - Difficult airway/aspiration risk?
    - Yes
    - No

- Yes, and equipment/assistance available

- Risk of >500ml blood loss (7ml/kg in children)?
  - Yes
  - No

- Yes, and adequate IV access/fluids planned

TIME OUT (To be read out loud)
Before start of surgical Intervention for example, skin incision

- Have all team members introduced themselves by name and role?
  - Yes
  - No

- Surgeon, Anaesthetist and Registered Practitioner verbally confirm:
  - What is the patient's name?
  - What procedure, site and position are planned?

- Anticipated critical events

  Surgeon:
  - How much blood loss is anticipated?
  - Are there any specific equipment requirements or special investigations?
  - Are there any critical or unexpected steps you want the team to know about?

  Anaesthetist:
  - Are there any patient specific concerns?
  - What is the patient's ASA grade?
  - What monitoring equipment and other specific levels of support are required, for example blood?

  Nurse/ODP:
  - Has the sterility of the instrumentation been confirmed (including indicator results)?
  - Are there any equipment issues or concerns?

- Has the surgical site infection (SSI) bundle been undertaken?
  - Yes
  - No
  - Not applicable
    - Antibiotic prophylaxis within the last 60 minutes
    - Patient warming
    - Hair removal
    - Glycaemic control

- Has VTE prophylaxis been undertaken?
  - Yes
  - No
  - Not applicable

SIGN OUT (To be read out loud)
Before any member of the team leaves the operating room

- Registered Practitioner verbally confirms with the team:
  - Has the name of the procedure been recorded?
  - Has it been confirmed that instruments, swabs and sharp counts are complete (or not applicable)?
  - Have the specimens been labelled (including patient name)?
  - Have any equipment problems been identified that need to be addressed?

- Surgeon, Anaesthetist and Registered Practitioner:
  - What are the key concerns for recovery and management of this patient?

This checklist contains the core content for England and Wales

www.npsa.nhs.uk/nrls

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Website: www.1000livescampaign.wales.nhs.uk
Part C: Prevent Perioperative cardiovascular events

1. Identifying patients at risk and provide appropriate DVT prophylaxis

For the purposes of the 1000 Lives Campaign, the DVT prophylaxis interventions are:

1. Documented DVT risk assessment of every surgical patient
2. All high-risk surgical/orthopaedic patients should receive graduated compression stockings combined with heparin (either unfractionated and low molecular-weight forms).
3. Intermediate-risk surgical patients considered for graduated compression stockings combined with heparin (either unfractionated and low molecular-weight forms).
4. Low-risk surgical patients do not require specific prophylaxis other than early mobilisation, unless other factors are present which increase overall risk and thus place them in intermediate or high-risk categories.

Where are we now?

Death from a Venous Thromboembolism (VTE) has prompted several high profile Department of Health (DH) reports. They indicate there are clear benefits for the implementation of preventative measures for this complication of surgery. They suggest considerable evidence generated from studies in surgical patients relating to the natural history, pathophysiology, diagnosis, screening, appropriateness of surrogate end points and prevention of VTE in surgical patient populations. There is also the increased morbidity associated with DVT and non-fatal PE and long term problems from post-thrombotic syndrome. Deep vein thrombosis (DVT) occurs in over 20% of surgical patients and over 40% of patients undergoing major orthopaedic surgery (DOH 2007). The prevention of these complications could significantly contribute to the number of lives saved and the reduction in harm to patients e.g. 20% of surgical patients over two years of the Campaign could equate to nearly 165,000 episodes of harm.
What changes can we make that will result in improvement?
Not only can the interventions described prevent the development of DVT in surgical patients, but the use of intermittent inflation ‘boots’ during surgery can contribute. Those patients know to be at risk of a DVT should have the boots on during the operating procedure. This is a multi faceted approach where all interventions should happen to the patient, not just one. Evidence also suggests that full length anti-embolism stocking are more beneficial than below-knee stocking.

Measure
The team need to identify a sub group of patients which they are going to use as a pilot for this intervention. Using PDSA cycles the team should use the process measures as a way of identifying a base line, and track improvement for this intervention. These measures are for the team to use internally within the organisation to identify improvements; they do not need to be reported either to the organisations board or the extranet. However they will wish to share them with their peers at the development events.

An example of good practice is Guys & St Thomas’ risk assessment and decision tree for adult surgical inpatients.

<table>
<thead>
<tr>
<th>Measure name:</th>
<th>% assessed for risk of DVT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure type:</td>
<td>Process</td>
</tr>
<tr>
<td>Related content area / driver:</td>
<td>Prevent Perioperative Cardiovascular Events</td>
</tr>
<tr>
<td>Description:</td>
<td>The percentage of surgical patients who have been assessed for the risk of developing a deep vein thrombosis (DVT).</td>
</tr>
<tr>
<td>Rationale:</td>
<td>The measure assesses whether units are complying with evidence-based practice. The implication is that high compliance should prompt the appropriate treatment of at risk patients and therefore reduce the risk of developing a DVT.</td>
</tr>
<tr>
<td>Numerator:</td>
<td>The total number of patients risk assessed in the pilot population.</td>
</tr>
<tr>
<td>Data Source:</td>
<td>Local Audit</td>
</tr>
</tbody>
</table>

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*Website: [www.1000livescampaign.wales.nhs.uk](http://www.1000livescampaign.wales.nhs.uk)*
<table>
<thead>
<tr>
<th>Measure name:</th>
<th>% receiving DVT prophylaxis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure type:</td>
<td>Process</td>
</tr>
<tr>
<td>Related content area / driver:</td>
<td>Prevent Perioperative Cardiovascular Events</td>
</tr>
<tr>
<td>Description:</td>
<td>The percentage of elective surgical patients on maintenance beta blockade who continued on beta blockade after surgery.</td>
</tr>
<tr>
<td>Rationale:</td>
<td>Compliance for eligible surgical patients receiving DVT prophylaxis will prevent perioperative and post operative cardiovascular events.</td>
</tr>
<tr>
<td>Numerator:</td>
<td>The total number of elective surgical patients continued on beta blockade protocol after surgery in the pilot population.</td>
</tr>
<tr>
<td>Data Source:</td>
<td>Local Audit</td>
</tr>
<tr>
<td>Denominator:</td>
<td>The total number of elective surgical patients already on beta blockade protocol in your pilot population during the month.</td>
</tr>
<tr>
<td>Data Source:</td>
<td>Local Audit</td>
</tr>
<tr>
<td>Method of calculation:</td>
<td>Calculate the actual percent of eligible patients receiving DVT prophylaxis by dividing the numerator by the denominator and then multiplying the resulting proportion by 100.</td>
</tr>
<tr>
<td>Collection guidance:</td>
<td>Review a minimum of 20 randomly selected case notes per month of elective surgical patients already on a beta blockade protocol. The key question is how many of these patients were maintained on a beta blockade protocol after surgery.</td>
</tr>
</tbody>
</table>

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| will have to create a new data series in the Extranet every time you add another area to your surgical population. |

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_Website: www.1000livescampaign.wales.nhs.uk_
2. Continue beta blockers for patients admitted on beta blockers

There is good evidence that abrupt withdrawal of beta-blockers is detrimental under most circumstances because of the regulation of the beta-adrenoreceptors that occurs in chronic use. Thus the drug labelling and patient information leaflets state that abrupt withdrawal should be avoided and should only be done on medical advice.

For the purposes of the 1000 Lives Campaign, the beta blockers interventions are:

1. Beta blockers should be continued in patients undergoing surgery who are receiving them to treat angina, symptomatic arrhythmias, hypertension, or other American College of Cardiology/American Heart Association class I guideline indicators.

Where are we now

The current guidelines state:

“Concerns regarding the discontinuation of beta-blocker therapy in the perioperative period have existed for several decades. Shammash and colleagues (2001) studied a total of 140 patients who received beta blockers preoperatively. Mortality in the 8 patients who had beta blockers discontinued postoperatively (50%) was significantly greater than in the 132 patients in whom beta blockers were continued (1.5%; OR 65.0, P less than 0.001). Hoeks and colleagues (2007) studied 711 consecutive peripheral vascular surgery patients. After adjustment for potential confounders and the propensity of its use, continuous beta-blocker use remained significantly associated with a lower 1-year mortality than among nonusers (HR: 0.4, 95% CI: 0.2 to 0.7). In contrast, beta-blocker withdrawal was associated with an increased risk of 1-year mortality compared with nonusers (HR: 2.7, 95% CI: 1.2 to 5.9). As noted in the recommendations, continuation of beta blocker therapy in the perioperative period is a class I indication, and accumulating evidence suggests that titration to maintain tight heart rate control should be the goal.”

(Fleisher et al 2007)
What changes can we make that will result in improvement?

Identify patients preoperatively who are on beta blockers

• Develop standard postoperative order sets or automatic protocols for provision of beta blockers to these patients, including the treatment of post operative hypovolaemia

• Designate responsibility for postoperative ordering of preoperative medications

• Educate patients about importance of continuing beta blockers post-op: encourage them to remind surgeon and anaesthetist that they take these

• Ensure that patients taking beta blockers are identified at pre-operative admission assessment and steps taken to ensure that the medication is prescribed on admission

An example of good practice is Taunton & Somerset NHS Trust, where the pre operative check list includes a check whether the beta blockers have been given. Also they have a protocol for the anaesthetic department to identify which drugs should continue during the surgical stay.

Measure

The team need to identify a sub group of patients which they are going to use as a pilot for this intervention. The team should use the process measures to identifying the base line and drive improvement using PDSA’s. These measures are for the team to use internally within the organisation to identify improvements; they do not need to be reported either to the organisations board or the extranet. However they will wish to share them with their peers at the development events.

Intranet: http://nww.1000livescampaign.wales.nhs.uk
Website: www.1000livescampaign.wales.nhs.uk
<table>
<thead>
<tr>
<th>Measure name:</th>
<th>% continued on beta blockade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure type:</td>
<td>process</td>
</tr>
<tr>
<td>Related content area / driver:</td>
<td>Prevent Perioperative Cardiovascular Events</td>
</tr>
<tr>
<td>Description:</td>
<td>The percentage of elective surgical patients on maintenance beta blockade who continued on beta blockade after surgery.</td>
</tr>
<tr>
<td>Rationale:</td>
<td>Compliance with patients on maintenance beta blockade who were continued on beta blockade will prevent perioperative cardiovascular events.</td>
</tr>
<tr>
<td>Numerator:</td>
<td>The total number of elective surgical patients continued on beta blockade protocol after surgery in the pilot population.</td>
</tr>
<tr>
<td>Data Source:</td>
<td>Local Audit</td>
</tr>
<tr>
<td>Denominator:</td>
<td>The total number of elective surgical patients already on beta blockade protocol in your pilot population during the month.</td>
</tr>
<tr>
<td>Data Source:</td>
<td>Local Audit</td>
</tr>
<tr>
<td>Method of calculation:</td>
<td>Calculate the actual percent of surgical patients on maintenance beta blockade continued on beta blockade by dividing the numerator by the denominator and then multiplying the resulting proportion by 100.</td>
</tr>
<tr>
<td>Collection guidance:</td>
<td>Review a minimum of 20 randomly selected case notes per month of elective surgical patients already on a beta blockade protocol. The key question is how many of these patients were maintained on a beta blockade protocol after surgery. If you start measuring this in a pilot population, you will have to create a new data series in the Extranet every time you add another area to your surgical population.</td>
</tr>
</tbody>
</table>

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*Website: [www.1000livescampaign.wales.nhs.uk](http://www.1000livescampaign.wales.nhs.uk)*
What You Need to Know about Infections after Surgery:  
*A Fact Sheet for Patients and Carers*

Most patients who have surgery do well. But sometimes patients get infections. This happens to about 3 out of 100 patients who have planned surgery. Infections after surgery can lead to other problems. Sometimes, patients have to stay longer in the hospital. Rarely, patients die from infections. Patients and their carers can help lower the risk of infection after surgery. Here are some ways:

**Days or weeks before surgery:**
When you meet with someone from your surgical team:
- Bring an up-to-date list of all the medications you take. Talk with your surgeon about why you take each medication and how it helps.
- Let the surgeon know if you are allergic to any medication and what happens when you take it.
- Tell the surgeon if you have diabetes or high blood sugar, or if family members do.
- Talk about ways to lower your risk of getting an infection. This may include taking antibiotic medicines.

**The day or night before surgery:**
Take extra good care of your body.
- **Do not** shave near where you will have surgery. Shaving can irritate your skin which may lead to infection. If you are a man who shaves your face every day, ask your surgeon if it is okay to do so.
- Keep warm. This may mean wearing warm clothes or wrapping up in blankets when you travel to the hospital. In cold weather, it also means heating up the car before you get in. Keeping warm before surgery lowers your chance of getting an infection.

**At the time of surgery:**
- Tell the anaesthetist (doctor or who puts you to sleep for surgery) about all the medications you take. A good way to do this is to bring a written up-to-date medication list with you.
- Let the anaesthetist know if you have diabetes or high blood sugar, or if family members do. People with high blood sugar have a greater chance of getting infections after surgery.
- Speak up if someone tries to shave you with a razor before surgery. Ask why you need to be shaved and talk with your nurse if you have any concerns.
- Ask for blankets or other ways to stay warm while you wait for surgery. Find out how you will be kept warm during and after surgery. Ask for extra blankets if you feel cold.

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• Ask if you will get antibiotic medicine. If so, find out how many doses you will get. Most people receive only one dose before surgery and are on antibiotics for just one day after surgery, as taking too much can lead to other problems.
• Ask about whether you need to wear special stocking to stop blood clots, and whether you need to have an extra medication to aid this.

You can learn more about Post operative Wound (Surgical Site) Infection as it relates to the 1000 Lives Campaign at www.1000livescampaign.wales.nhs.uk

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Website: www.1000livescampaign.wales.nhs.uk
Appendix One

Using the National Reporting and Learning System (NRLS) to feedback to trust about post operative wound infections

All trusts in Wales have signed up to the 1000 Lives Campaign, which involves a number of interventions to reduce death and harm in patients receiving care in the NHS in Wales. One of the package of interventions relates to preventing post operative wound infections by ensuring patients receive appropriate antibiotics during surgery, are kept normothermic, glycaemic control (for insulin dependent diabetic patients) and appropriate hair removal from the surgical site. Identifying which patients develop a post operative wound infection is a challenge for trusts as a vast majority of patients will be cared for by you in the primary care setting. We are therefore asking you let the trust know if patients who are discharged after elective surgery develop a post operative wound infection. This can be done in a number of ways; either you will receive a specific monitoring form for the patients discharged after surgery, by using the National Patient Safety Agency’s electronic reporting tool, or by your usual methods.

This quick reference guide to reporting aims to help make it easy for you to report these episodes of post operative wound infections both to the trust and to the NPSA (where they will be collated with other incident data). You can also use this form to report all types of patient safety related incidents and may find saving the link on your desktop saves time in the future.

Follow the steps below to submit a report.

1. Getting started
   • Log on to http://www.eforms.npsa.nhs.uk/staffeform/
   • Follow the prompts and use the drop down menus to choose options. Please supply as much detail as you can.
   • Once you have entered the location where the incident occurred, an ID number will appear at the bottom of the screen that is unique to your report. If you need to delay or interrupt completing the form, you can use this number to return to your report at a later date.
   • Click on the ‘Help’ buttons if you need more information.
   • Make sure you enter the care setting where the incident happened not the setting where it was picked up.

Definition: Patient safety incident: any unintended or unexpected incident which could have or did lead to harm for one or more patients receiving NHS funded care.

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2. Giving details of the incident

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• When you are asked ‘what happened?’ please use the above categories.

• You will be asked to enter details about the incident in the free text box. A brief overview of the incident is all that is required. Please do not put any patient or staff details in this section.

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Later on in the form you will be asked about the impact on the patient. If you have had to give antibiotics or the patient has been readmitted to hospital then the impact should be reported as moderate.

Many of the fields in the medicine incident section are optional. However, it will help the NPSA build a better picture of problems affecting patient safety if you are able to provide as much detail as possible.

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• So that the trust to be able to identify the patient, where possible can the patient’s date of birth be recorded in this section?

Sharing your report
• In order for the incident to be shared with the trust and therefore matched to their records, on the last page tick share with local organisation box choose this option from the drop down choices in the appropriate box - THIS IS VITAL.

• In this section where it asks for a local reference we suggest you put in the patients NHS number, again to facilitate cross referencing. This information will not be shared with the NPSA but the local trust will get it.

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Website: www.1000livescampaign.wales.nhs.uk
• You can also save and print copies of the report, however choosing this option does not mean you have submitted the report to the NPSA, you must choose submit button.

4. Saving the URL for another day
• To ensure you can easily access the eform anytime you can save the URL to your favorites on the tool bar at the top of the page (click on save to favorites, and add it to the list).
• To get this on your desk top - save to your favorites and right click on it. Then click on ‘sent to - desktop’ and a short cut will be created.
• Don’t forget you can use it to inform the LHB about incidents as well.
# Appendix Two

## Surgical Complications - the surgical pathway

<table>
<thead>
<tr>
<th>Preoperative Assessment</th>
<th>Surgical Ward</th>
<th>Anaesthetic room</th>
<th>Theatre</th>
<th>Recovery</th>
<th>Post Op Surgical Ward</th>
</tr>
</thead>
<tbody>
<tr>
<td>May start Antibiotics</td>
<td>Document Antibiotics administered</td>
<td>Check Antibiotics given before incision*</td>
<td>Document blood sugar</td>
<td>Discontinue Antibiotics at 24 hours*</td>
<td></td>
</tr>
<tr>
<td>Advise patients not to shave</td>
<td>If removing hair only use electric razor</td>
<td>If removing hair only use electric razor*</td>
<td>Document Antibiotics administered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blood sugar check morning of surgery in diabetics*</td>
<td>Document temp and keep warm / actively warm</td>
<td>Document temp</td>
<td>Document temp every 30 mins</td>
<td>Document temp every 15 mins</td>
<td></td>
</tr>
<tr>
<td>Transfer to theatre suitably dressed</td>
<td>Document temp</td>
<td>Actively warm if at risk of hypothermia</td>
<td>Actively warm if hypothermic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blood sugar check morning of surgery in diabetics*</td>
<td>Document temp and keep warm / actively warm</td>
<td>Document temp</td>
<td>Document temp every 30 mins</td>
<td>Document temp every 15 mins</td>
<td></td>
</tr>
<tr>
<td>Documented Risk Assess for hypothermia*</td>
<td>Document temp</td>
<td>Actively warm if at risk of hypothermia</td>
<td>Actively warm if hypothermic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Documented Risk assess for DVT*</td>
<td>Apply graduated compression stockings</td>
<td>Use warm IV / Irrigation fluids</td>
<td>Documented Risk assess for DVT*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identify diabetic patients - allocated to morning / first on list</td>
<td>Test blood glucose 2 hourly Stop SC insulin and set up insulin infusion</td>
<td>Test blood glucose and admin infusion as per protocol</td>
<td>Test blood glucose on arrival and then hourly and admin infusion as per protocol</td>
<td>Test blood glucose 2-4 hourly depending on stability Restart feeding / SC regime asap</td>
<td></td>
</tr>
<tr>
<td>Highlight whether on Beta blockers</td>
<td>Administer Beta blockers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* suggested process measurement points.

Intranet: [http://nww.1000livescampaign.wales.nhs.uk](http://nww.1000livescampaign.wales.nhs.uk)
Website: [www.1000livescampaign.wales.nhs.uk](http://www.1000livescampaign.wales.nhs.uk)
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WHO Checklist References


http://www.who.int/patientsafety/safesurgery/en/

Maintenance of Glycaemic Control references


