The ‘How to Guide’ for Reducing Surgical Complications

Create a Team Culture: Implementing the World Health Organisation (WHO) Safer Surgery Checklist

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Driver Diagram

Content area

Reducing Surgical Complications

Prevent Post Operative wound (Surgical Site) Infections in elective surgery

Create a team culture attuned to detecting & rectifying intra operative errors

Prevent Perioperative Cardiovascular Events

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

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Reducing Surgical Complications

Introduction
This guide proposes using the “model of improvement” methodology to implement an NPSA alert. Although the NPSA alert is mandated by the Healthcare Standards in Wales, the experience gained by teams in the 1000 Lives Campaign over the last twelve months to implement evidence based clinical practices should improve the reliability and speed of implementation of the alert which concerns the World Health Organisation (WHO) “Safer Surgery Checklist”. The checklist has been demonstrated already to save lives and reduce harm associated with surgery.

Therefore the 1000 Lives Campaign, and in particular the Surgical Complications director and faculty members, are endorsing the use of the checklist, which was developed by the WHO as part of their ‘Second Global Patient Safety Challenge; Safe Surgery Saves Lives’ initiative and wish to include it as an additional intervention in the 1000 Lives Campaign with immediate effect.

In February 2008 at an event held in the UK to publicise the checklist, Dr Atul Gawande, the project lead for the Safer Surgery checklist, stated:

‘This extraordinary coalition of United Kingdom’s leading organisations for surgeons, anaesthesia professionals and nurses has endorsed a seemingly mundane but revolutionary idea: that a simple operating room checklist could save lives in surgery the same way that pilots’ checklists have saved lives in aviation for the last half century.’

According to Dr Gawande, the checklist does not add to what should be done but creates a routine to make sure that all the appropriate procedures are performed consistently. He also highlighted that the use of checklists can improve performance; when Michigan introduced a central venous catheter checklist into their hospitals

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"their infection rates dropped by two thirds; 1500 lives and $200m (£100m; €126m) were saved in the first 15 months."

Eight pilot sites (Seattle, USA; Toronto, Canada; London, UK; Ifakara; Tanzania; Amman, Jordan; New Delhi, India; Manila, Philippines; and Auckland, New Zealand) used the checklist for between October 2007 to September 2008.

Data were collected from 7,688 patients, 3,733 before implementation of the checklist and 3,955 after the checklist was introduced. The rate of major complication in the pilot study operating rooms fell from 11% in the baseline period to 7% after introduction of the checklist, a reduction of more than one third. Patient deaths following surgical operations fell by more than 40% (from 1.5% to 0.8%) with introduction of the checklist. Similar reductions in complications were seen in both the high income and lower income sites in the study, with rates falling from 10.3% to 7.1% and 11.7% to 6.8% respectively (Haynes, Weiser et al. 2009).

Results have also identified an increase in the rate of adherence to standards from 36% to 68% and in some hospitals to almost 100%. Therefore the checklist also provides the opportunity to ensure other interventions in the 1000 Lives Campaign are being reliably embedded into practice such as; on-time antibiotics and DVT prophylaxis.

Surgical work generally occurs in teams, especially in the operating room itself. Teamwork is essential in health care today and communication within the team is indicative of the organisational culture. Hierarchy, “handoffs” and transitions, and different communication styles between professions all contribute to communication failures. Communication between members of the team is not always effective, sometimes because the message is delivered in an uncoordinated, unorganized manner, resulting in the message being received differently than intended. Communication failure is at the core of nearly every medical error and adverse event. The Joint Commission for Accreditation of Healthcare Organizations (JCAHO) collects voluntary reports of sentinel events; communication is reported as the root cause in

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more than 75% of operative and postoperative sentinel events (JCAHO Sentinel Event Statistics).

**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 *Appendix one*.


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)).

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If you would like to view a short film about the checklist please go to 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 Model for Improvement

What do we want to accomplish? (Aims)
- Increase staff awareness of patient safety issues
- Create an environment where staff freely share information about safety issues without fear of reprisal
- Integrate safety into the daily routine
- Change the culture

How will we know that a change is an improvement? (Measures)
- Number of safety issues identified by staff
- Amount of information shared among staff
- Number of “near misses,” i.e., errors caught before reaching the patient, reported
- Percentage of patients whom the checklist is used for

What change can we make that will result in an improvement? (Changes)
- Conduct time out prior to one patient.

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

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• 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:

![Spread Plan Diagram]

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 are 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 improvements; they do not need to be reported either to the organisations board or the **extranet**. However the model for improvement

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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.

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Value</th>
<th>Number of elective patients which completed 'timeout' safer surgery checklist</th>
<th>Number of elective patients in the sample</th>
<th>Annotation Type</th>
<th>Annotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week of 9/29/2008</td>
<td>20.0</td>
<td>4</td>
<td>20</td>
<td>Event</td>
<td>Data collection and intervention started. Theatre A only</td>
</tr>
<tr>
<td>Week of 10/6/2008</td>
<td>25.00</td>
<td>5</td>
<td>20</td>
<td>None</td>
<td>-</td>
</tr>
<tr>
<td>Week of 10/13/2008</td>
<td>50.0</td>
<td>10</td>
<td>20</td>
<td>None</td>
<td>-</td>
</tr>
<tr>
<td>Week of 10/20/2008</td>
<td>50.0</td>
<td>10</td>
<td>20</td>
<td>None</td>
<td>-</td>
</tr>
<tr>
<td>Week of 10/27/2008</td>
<td>75.00</td>
<td>15</td>
<td>20</td>
<td>None</td>
<td>-</td>
</tr>
<tr>
<td>Week of 11/3/2008</td>
<td>50.0</td>
<td>10</td>
<td>20</td>
<td>None</td>
<td>-</td>
</tr>
<tr>
<td>Week of 11/10/2008</td>
<td>70.0</td>
<td>14</td>
<td>20</td>
<td>None</td>
<td>-</td>
</tr>
<tr>
<td>Week of 11/17/2008</td>
<td>95.00</td>
<td>19</td>
<td>20</td>
<td>None</td>
<td>-</td>
</tr>
<tr>
<td>Week of 11/24/2008</td>
<td>95.00</td>
<td>19</td>
<td>20</td>
<td>None</td>
<td>-</td>
</tr>
<tr>
<td>Week of 12/1/2008</td>
<td>50.0</td>
<td>10</td>
<td>20</td>
<td>Event</td>
<td>Theatres A &amp; B now using intervention</td>
</tr>
<tr>
<td>Week of 12/8/2008</td>
<td>70.0</td>
<td>14</td>
<td>20</td>
<td>None</td>
<td>-</td>
</tr>
</tbody>
</table>

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We would like to thank the “Patient Safety First” campaign team in England for the use of some of their material in developing this guide.

We would also like to thank Dr Gawande, Dr Bill Berry and Dr Tom Weiser at Harvard School of Public Medicine for their help and support.
Appendix Two

AIM: to use the Safer Surgery Checklist in 95% patients within the pilot population within one month

PLAN 1:
Prediction: Checklist will be successfully used for one list

Plan for change or test - who, what, when, where:
Mr Jones’s Thursday pm list has 5 patients, the time out will be tested for each patient and then reviewed at the end of the day.

Plan for collection of data - who, what, when, where:
The hard copy of the operating list will be ticked when the checklist is completed by the runner.

DO:  
Carry out change or test. Collect data and begin analysis.

STUDY:  
Complete analysis and data:  
The data was only collected in 4 out of 5 patients because the list ran over.

How did or didn’t the results of this cycle agree with the predictions that we made earlier?  
The checklist wasn’t used for all patients because the list ran over so it was agreed to drop it for the last patient.

Summarize the new knowledge we gained by this cycle:  
The use of the list needed more explanation for the first two patients and although there were tick boxes there was no place to put comments when issues were raised such as the need for xray in particular cases.

ACT:  
List actions we will take as a result of this cycle:
- Put comment section on back of sheet to record comments
- Review which questions need clarification and agree as a team what they mean (record agreement)
- Record the time taken to go through Time out section to ensure appropriate item allocated for list

Plan for the next cycle (adapt change, another test, implementation cycle?):  
Test adapted checklist for one patient during next Tuesdays list, do quick debrief and then test again.

PLAN 2:
Prediction: Checklist will be successfully used for one list

Plan for change or test - who, what, when, where:
Mr Jones’s Tuesday pm list has 3 patients, the time out will be tested for one patient and then reviewed at the end of the case.

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Plan for collection of data - who, what, when, where:
The hard copy of the operating list will be ticked when the checklist is completed by the runner.

**DO:**
Carry out change or test. Collect data and begin analysis.

**STUDY:**
Complete analysis and data:
Test was undertaken.

How did or didn’t the results of this cycle agree with the predictions that we made earlier?
The addition of the comments section aided the flow of the timeout allowing the circulating nurse to record the contingency plans needed for the case.

Summarize the new knowledge we gained by this cycle:
There was a greater understanding of what the boxes meant and the time taken to use the checklist was shorter.

**ACT:**
List actions we will take as a result of this cycle:
- None

Plan for the next cycle (adapt change, another test, implementation cycle?):
- Repeat test

**PLAN 3:**
Prediction: Checklist will be successfully used for one list

Plan for change or test - who, what, when, where:
Mr Jones’s Thursday pm list has 4 patients, the sign will be tested for each patient and then reviewed at the end of the day.

Plan for collection of data - who, what, when, where:
The hard copy of the operating list will be ticked when the sign in checklist is completed by the OPD in the anaesthetic room.

**DO:**
Carry out change or test. Collect data and begin analysis.

**STUDY:**
Complete analysis and data:
The data was only collected for all 4 patients.

How did or didn’t the results of this cycle agree with the predictions that we made earlier?
The sign in section repeated the information already checked on the organisation's existing checklist leading to confusion as to which checklist to sign.

Summarize the new knowledge we gained by this cycle:
The use of the sign in needed more exploration on how it fitted with the existing checklist.

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**ACT:**
List actions we will take as a result of this cycle:
- Agree for next list used for test to only use the Safer Surgery sign in checklist for the anaesthetic room
- Test both the sign in and time out process for the same patients
- Record the time taken to go through both sections to ensure appropriate time allocated for list
- Develop a bespoke recording sheet

Plan for the next cycle (adapt change, another test, implementation cycle?):
Test checklist for next Tuesdays list.
References


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