Improved compliance with the World Health Organization Surgical Safety Checklist is associated with reduced surgical specimen labelling errors

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ABSTRACT

Aims: A new approach to administering the surgical safety checklist (SSC) at our institution using wall-mounted charts for each SSC domain coupled with migrated leadership among operating room (OR) sub-teams, led to improved compliance with the Sign Out domain. Since surgical specimens are reviewed at Sign Out, we aimed to quantify any related change in surgical specimen labelling errors.

Methods: Prospectively maintained error logs for surgical specimens sent to pathology were examined for the six months before and after introduction of the new SSC administration paradigm. We recorded errors made in the labelling or completion of the specimen pot and on the specimen laboratory request form. Total error rates were calculated from the number of errors divided by total number of specimens. Rates from the two periods were compared using a chi square test.

Results: There were 19 errors in 4,760 specimens (rate 3.99/1,000) and eight errors in 5,065 specimens (rate 1.58/1,000) before and after the change in SSC administration paradigm (P=0.0225).

Conclusions: Improved compliance with administering the Sign Out domain of the SSC can reduce surgical specimen errors. This finding provides further evidence that OR teams should optimise compliance with the SSC.

The World Health Organization (WHO) introduced the Surgical Safety Checklist (SSC) with the intent of improving communication and preventing errors or omissions in the operating room (OR). The SSC is composed of three domains: ‘Sign In’ (administered when the patient arrives in the OR); ‘Time Out’ (administered immediately prior to the first incision); and ‘Sign Out’ (administered before the patient leaves the OR). In the most common administration paradigm the SSC is initiated and administered by the OR circulating nurse reading from a paper copy of the checklist.

Adoption of the SSC has been shown to reduce surgical complications and mortality. Perhaps not surprisingly there is accumulating evidence that better compliance with the administration of the SSC items is associated with a greater likelihood of improved patient outcomes. With the aim of increasing compliance and engagement with the SSC in our institution we eliminated the paper SSC and developed large posters (one for each domain) to display our adapted version of the SSC on the OR wall. In addition, we allocated responsibility for leadership of each domain to the OR sub-team most central to the processes occurring at the time: thus, the Sign In, Time Out and Sign Out domains were led by anaesthesia, surgery and nursing respectively. This paradigm change has resulted in many significant improve-
ments in compliance and engagement of OR sub-teams in SSC administration including vastly improved compliance with administrating the SSC Sign Out domain (from 22% to 84% of cases). 7

One of the SSC items administered in the Sign Out domain requires a review of any surgical specimens and their labelling (the words are “specimen description, quantity and patient identification correct”). We therefore hypothesised that improved compliance with the Sign Out phase of the checklist would reduce errors in the labeling of specimens, and undertook an evaluation of specimen labelling errors before and after the roll-out of the new SSC administration paradigm to investigate whether the improved compliance with Sign Out was associated with error reduction.

Methods

This retrospective audit was approved by the Auckland District Health Board (ADHB) Research office (Reference: A+ 7093). The SSC administration paradigm change was sequentially rolled out across five OR suites (A-E, see Table 1) within the ADHB, a large tertiary health service provider for the greater Auckland region. The roll-out process is described in more detail elsewhere. 7 OR staff were not made aware of plans to audit specimen labelling errors after roll-out of the new checklist administration paradigm. Specimen labelling error data were collected for each OR suite over a six month period prior to, and a six month period after each suite's SSC administration paradigm change date (Table 1).

Data collection

In the OR, each surgical specimen is placed in a specimen pot and labelled with patient identifying details and specimen details. A specimen analysis request form is also completed, which includes patient, specimen and laboratory analysis details. This is performed by one of the OR team members, usually a nurse. Confirmation of completion and details of the specimen pot and labelling is supposed to occur as part of the Sign Out domain, before the specimen is sent to the laboratory for analysis.

We defined a specimen labelling error as any error in the labelling or completion of the specimen pot or the specimen laboratory request form identified by the laboratory after receipt of the specimen. These errors were prospectively recorded on specimen labelling error forms by laboratory staff who followed up with the OR team to clarify details and/or anomalies. For each suite we identified specimen labelling error forms that pre-dated and post-dated that suite's roll-out date for the new SSC administration paradigm for up to six months.

This prospectively maintained file of specimen labelling error forms was the source of all data. We included only the specimen labelling errors occurring in the five OR suites. Any errors occurring in a clinic or ward environment where the SSC was not a mandated part of standard practice were excluded. In addition, OR specimens that were sent to the laboratory prior to the completion of Sign Out (such as frozen sections) were excluded. The total number of relevant specimens received by the laboratory from the five OR suites

Table 1: OR suites in the ADHB health service included in the current audit.

<table>
<thead>
<tr>
<th>OR suite</th>
<th>Number of ORs</th>
<th>Surgical specialties</th>
<th>Date of SSC paradigm change</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>13</td>
<td>general, orthopaedics, vascular, urology, neurosurgery</td>
<td>24/11/2014</td>
</tr>
<tr>
<td>B</td>
<td>7</td>
<td>paediatric surgery</td>
<td>27/1/2015</td>
</tr>
<tr>
<td>C</td>
<td>7</td>
<td>cardiothoracic surgery, otorhinolaryngology</td>
<td>9/2/2015</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>obstetrics and gynaecology</td>
<td>10/3/2015</td>
</tr>
<tr>
<td>E</td>
<td>8</td>
<td>Day stay unit for general surgery, oral health, otorhinolaryngology, gynaecology, urology, orthopaedics, ophthalmology</td>
<td>16/3/2015</td>
</tr>
</tbody>
</table>
during the study period was obtained from the clinical records department of the laboratory.

**Statistical analysis**

The primary endpoint was a comparison of the rate of specimen labelling errors for the periods before and after the introduction of the new SSC administration paradigm. Error rates were calculated as the number of specimen labelling errors divided by the total number of specimens received by the laboratory in each of the six-month study periods, and were reported as errors per 1,000 specimens. Rates were compared using the Chi-square test, or Fisher's exact test where rates were low. A p-value ≤0.05 was considered statistically significant. Analyses were conducted using IBM SPSS version-22.

**Results**

A total of 9,825 specimens was received by the laboratory from the ORs in the full 12-month period: 4,760 of these were in the six-month period preceding the SSC paradigm change (PRE-period), and 5,065 were in the six-month period after SSC paradigm change (POST-period).

A total of 27 specimen labelling errors was recorded over the 12-month period, giving a total error rate of 0.275% (2.75 errors per 1,000 specimens). Rates were compared using the Chi-square test, or Fisher's exact test where rates were low. A p-value ≤0.05 was considered statistically significant. Analyses were conducted using IBM SPSS version-22.

**Table 2: Rates of specimen labelling errors for all OR suites for the 12 month study period (All errors), then separated into the six month periods before (PRE) and after (POST) the SSC paradigm change. Rates are per 1,000 cases. Raw error numbers are also given in brackets.**

<table>
<thead>
<tr>
<th>Error type</th>
<th>All errors N=27</th>
<th>PRE N=19</th>
<th>POST N=8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen—incorrect patient identifying details</td>
<td>0.712 (7)</td>
<td>1.050 (5)</td>
<td>0.395 (2)</td>
</tr>
<tr>
<td>Specimen—no patient identifying details</td>
<td>1.120 (11)</td>
<td>1.682 (8)</td>
<td>0.592 (3)</td>
</tr>
<tr>
<td>Specimen form—no patient identifying details</td>
<td>0.712 (7)</td>
<td>0.840 (4)</td>
<td>0.592 (3)</td>
</tr>
<tr>
<td>Specimen form—incorrect completion</td>
<td>0.102 (1)</td>
<td>0.210 (1)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Specimen—empty specimen pot</td>
<td>0.102 (1)</td>
<td>0.210 (1)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

**Conclusions**

A modified SSC administration paradigm in which the checklist appears on large wall-mounted posters, and where leadership of each domain is allocated to a different OR sub-team has been introduced to our institution. A recently published study undertaken in one of the five OR suites (Suite A in Table 1) demonstrated that this initiative resulted in dramatic improvements in compliance and engagement in checklist administration.7 One of the notable improvements was an increase in the frequency of administration of the Sign Out domain (from 22% to 84% of cases). That study did not, however, measure patient outcomes or other indicators of patient safety that might be influenced by the improvement in SSC compliance.

In the present study we found that the rate of surgical specimen labelling errors more than halved in the six months following introduction of the new SSC administration paradigm. Although we cannot definitively attribute this error reduction to the change in SSC paradigm, the related improvement in compliance with administration of the Sign Out domain does provide a compelling explanation. Sign Out contains a checklist item which requires explicit review of the number, nature and labelling of specimens. The fact that this is now administered in the vast majority of cases as opposed to the vast minority likely underpins the reduction in errors, especially as there were no other process interventions or educational initiatives over the same period that might account for or have contributed to the change.
This is an important finding for several reasons. First, specimen labelling errors may have serious consequences in the provision of medical and surgical care, having the potential to delay, impede and/or misdirect management options. Minimising these errors is clearly desirable and their rate is an important quality measure in patient safety. Complying with the Sign Out domain of the SSC is a simple, cheap intervention that, on the basis of these findings, may have significant impact on this quality measure. Second, if we accept that improved compliance with Sign Out was the explanation for the reduction in specimen errors, this study lends further weight to the assertion that adopting a checklist “in name” is not sufficient to reap its potential benefits. The checklist actually has to be used; ideally with all OR staff paying full attention to the process. This point was emphasized in a recent editorial which stated: “The obvious point here is that checklists do not work by themselves: they must be used, and used in an engaged fashion with the mind focused on the issues at hand”.

There are several limitations of this study that must be acknowledged. First, we did not conduct a parallel evaluation of a control hospital or group of OR suites where the checklist paradigm changes did not occur. This could have provided some reassurance that the observed reduction in specimen labelling errors in our suites after converting to the new paradigm was not due to some other unanticipated factor. Nevertheless, we believe that the association between a dramatic improvement in compliance with sign out under the new paradigm and a concomitant reduction in specimen labelling error rates is plausibly explained by the prescription of a specimen check during Sign Out.

Second, the number of specimen errors was relatively small. Nevertheless, the rates are congruent with those reported from other institutions, and the denominator is large.

Third, the data demonstrating improvement in Sign Out compliance after introduction of the new SSC administration paradigm published by Ong et al came from one (albeit the largest) of the five OR suites that contributed data to the present study. We therefore cannot be certain that the improvement in compliance with Sign Out was equivalent across all suites. It may not have been as substantial in other suites, but equally, it may have been even greater; anecdotally, Sign Out was virtually never done in several locations before the paradigm change. Thus it seems very likely that there was an improvement in other suites similar to that demonstrated in Suite A (Table 1); especially given that the change to SSC practice was rolled out in a standardised fashion across all suites.

Fourth, we have assumed that all specimen labelling errors are both detected and reported. This assumption may not be valid, but any inaccuracy in this regard would probably be equally distributed across the two periods examined.

Fifth, our audit methodology was not capable of capturing all errors relating to specimen labelling that might have been affected by improved Sign Out compliance. For example, errors relating to the description of a specimen detected at Sign Out and corrected before despatch of the specimen to the laboratory would not be captured. It follows that the beneficial effect of the SSC on this quality measure may be greater than we have demonstrated here.

A final point which is an observation rather than a limitation is that we did not attempt to subdivide the individual errors according to the risk they represented to the involved patients. To do so would have divided the numerator into sizes too small to be meaningful, and would have substantially missed the point; all of these errors are indicative of an imperfect process that could ultimately result in patient harm given the right circumstances. Prevention of even minor errors will almost certainly result in a milieu in which major errors are also less likely.

We conclude, therefore, that an improvement in compliance with the Sign Out domain of the WHO SSC was associated with a significant reduction of specimen labelling errors in our hospital. These findings lend weight to the Health Quality and Safety Commission's current advocacy for adoption of the SSC administration paradigm described by Ong et al by all New Zealand District Health Boards.
REFERENCES:


