

BMJ Open Quality Improving surgical wound classification accuracy through education and audit processes

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ABSTRACT

Precise wound classification is essential for surgical site infection risk stratification and appropriate hospital reimbursement. We instituted a multifaceted approach to improve institutional wound class identification including an education and awareness bundle, as well as a formal audit process. Overall, we saw significant improvements in wound class accuracy, interprofessional collaboration and provider compliance.

BACKGROUND

Accurate surgical wound classification is an essential predictor for surgical site infections (SSI) and affects pay-for-performance.¹⁻³ Colorectal procedures with contaminated or dirty wounds pose the highest risk of SSI among elective surgeries.^{4 5} This was true in our patients with higher SSI rates than other surgeries and the national average for colorectal surgery.

Studies have shown periodic staff training and auditing can lead to increased accuracy in wound classification.^{1 3 6} There is a gap in the current literature, however, regarding the implementation of a nursing-led team approach that integrates specific educational strategies, including consensus guidelines, formal training, automated reporting, physical reminders and marketing, in combination with structured audits to improve documentation accuracy. To address this gap, we launched a novel initiative at UT Southwestern Medical Center (UTSW), an academic hospital in Dallas, Texas.

METHODS

Baseline data collection

To assess baseline performance, a team of independent SSI registry subject-matter experts evaluated wound class data for colorectal surgeries performed between March 2021 and September 2021 (N=153). They identified key gaps regarding the process: (a) low surgeon inter-rater reliability,

(b) lack of clear communication between surgeons and nurses in the operating room (OR), (c) inconsistencies between documented class and operative note description and (d) lack of a standardised process.

Context

A multidisciplinary task force was formed to implement improvement strategies. They standardised wound class definitions, developed education and awareness plans and conducted formal chart audits. This strategy employed Plan-Do-Study-Act principles, designing interventions based on the gaps identified in the baseline data (Plan stage).

Interventions

In October 2021, we implemented standardised wound class definitions, creating a chart based on the Association of Perioperative Registered Nurses guidelines and consensus from the colorectal surgeons. Next, an educational bundle was introduced:

1. Clinical education: all OR personnel involved in colorectal procedures were educated on the wound class chart and the importance of documentation accuracy.
2. Laminated charts: wound classification charts were displayed in ORs.
3. Marketing: information was disseminated through internal informatics newsletters.

In November, we began a formal chart audit process each week. Our reviewers identified errors and sent emails to OR nurses and surgeons requesting the amendment of misclassified cases. Each of the aforementioned interventions represented the 'Do' stage of our PDSA cycle.

Statistical analysis

To study our PDSA interventions, we did multiple statistical analyses. Using SAS V.9.4 (SAS Institute, Cary, North Carolina, USA), we performed two analyses to measure wound class accuracy rate before and after



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**Table 1** Wound classification documentation accuracy by audit and education phase

| Education phase | Audit phase | | | | | |
|--------------------------|-------------|---------------|-------------------|-------------|---------------|-------------------|
| | Pre-audit | | | Post-audit | | |
| | Total cases | Correct cases | Accuracy rate (%) | Total cases | Correct cases | Accuracy rate (%) |
| Pre-education (baseline) | 153 | 95 | 62 | – | – | – |
| Post-education | 436 | 359 | 82 | 436 | 421 | 97 |

interventions were introduced. To assess the educational bundle, Pearson's χ^2 test was used to compare accuracy rate during the baseline period prior to bundle introduction versus after bundle introduction. To evaluate the effectiveness of the chart audit intervention, McNemar's test was performed to compare the accuracy rate before versus after audit emails were sent for cases occurring between November 2021 and November 2022.

RESULTS

The introduction of educational and chart audit interventions improved wound classification accuracy (table 1). There was a 20% increase in accuracy after the education bundle was implemented, from 62% to 82% ($p < 0.001$). There was also a 15% increase in accuracy after audit emails were sent, from 82% to 97% ($p < 0.001$). Accuracy data were compiled and discussed with task force members at recurring intervals to determine whether to adapt, adopt or abandon these change ideas (the 'Act' of our PDSA cycle).

DISCUSSION

The implementation of our audit and educational interventions significantly improved the precision of wound class documentation. The chart audit process established a feedback loop to surgeons and OR staff about their individual accuracy and documentation, thus promoting accountability and awareness. Because this process was both successful (significant improvement from 82% to 97%, $p < 0.001$) and well tolerated by providers, we can be confident that it led to quality improvement, and we adopted this as our standard practice. By October 2022, 95% of clinicians responded to email audits, demonstrating enthusiastic buy-in for the audit process.

Compared with baseline, immediate improvements were observed in the post-education group (pre-audit), but the impact in the post-audit group did not occur for several months. The slower but overall greater improvement after the audit intervention was due to the way staff were exposed to audits (ie, only following identification of errors in the documentation). For instance, 22% of staff received an email within the first 3 months of the audit and 37% received an email within 6 months of the audit, which is consistent with the incremental increases in accuracy seen over the same period. Due to the following factors, we are unable to attribute whether education or audit interventions were more significant to the accuracy improvement:

- ▶ The lag in accuracy improvement seen in the post-audit group.
- ▶ The simultaneous roll out of chart audit emails.
- ▶ The lack of educational reinforcement.

Due to its success, UTSW has formally adopted this full educational and audit process. To increase process sustainability, we are actively exploring the implementation of automated wound classification within colorectal preference cards and the electronic medical record. Operating room nurses can use these preference cards as a tool to clarify the final wound class with the surgeon.

The limitations of this project include that it was conducted at a single site, and we did not correlate our results with the SSI rates. In addition, while previous research suggests wound classification auditing initiatives may improve interprofessional teamwork and communication among operating room staff, this body of literature is limited. Our study did not measure these outcomes.^{1 3 7}

Finally, since most of our interventions were implemented at the same time or closely together, it is difficult to ascertain which interventions are better to adopt versus abandon, rather than using all interventions as a whole.

In summary, our study is significant in showing that the educational/awareness bundle described combined with an auditing system can drive quality improvement in wound classification accuracy at a large academic medical centre. We believe these processes can be replicated by other similar institutions struggling with appropriate documentation of wound class, helping hospital systems improve reimbursement and providing more accurate representation of their quality of care.

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