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REVIEW ARTICLE

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Surgical wound classification in otolaryngology: A state-of-the-art review

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Abstract

Objective: To describe the issues related to the assignment of surgical wound classification as it pertains to Otolaryngology—Head & Neck surgery, and to present a simple framework by which providers can assign wound classification.

Data Sources: Literature review.

Conclusion: Surgical wound classification in its current state is limited in its utility. It has recently been disregarded by major risk assessment models, likely due to inaccurate and inconsistent reporting by providers and operative staff. However, if data accuracy is improved, this metric may be useful to inform the risk of surgical site infection. In an era of quality-driven care and reimbursement, surgical wound classification may become an equally important indicator of quality.

KEYWORDS
ENT, health care spending, OHNS, otolaryngology, quality improvement, reimbursement, surgical site infection, wound classification

Key points

- In its current state, surgical wound classification has been disregarded as a key metric, likely due to habitual inaccuracies in procedure categorization.
- A new paradigm for surgical wound classification specific to Otolaryngology—Head & Neck Surgery is presented.
- The possibility of surgical wound classification serving as an important indicator of quality of care is discussed and contextualized in current health care trends.

INTRODUCTION

First introduced in 1964, surgical wound classification (SWC) has become a routine component of procedure documentation.[1] Refined over decades, this practice characterizes the cleanliness of the surgical field and is pertinent because of the correlation between wound contamination and the risk of postoperative surgical site infection (SSI).[2–9] In the General Surgery literature, rates of superficial SSI in clean cases have been found to be low, around 1.8%, ranging up to 5.1%–8.5% for dirty cases.[10,11] Within Otolaryngology—Head & Neck Surgery (OHNS), SWC has also been identified as a significant risk factor for SSI, particularly within Head and Neck ablative surgery and endocrine surgery.[12–22] It has also been linked to an increase in the incidence of postoperative complications,[23–25] increased length of hospital stay,[26] and greater rates of hospital readmission.[26,27]

The incidence of SSI within a hospital system is an important indicator of quality of care.[28,29] Studies have shown that a high rate of SSI adds to the hospital cost-burden and places additional stress on health care utilization. In 2005 alone, SSI was associated with over 400,000 additional days of hospital stays, with additional hospital costs totaling nearly $1 billion before accounting for costs of readmission.[30] A 2014 Department of Veterans Affairs study found hospital costs were increased by a factor of 1.43 in cases involving SSI.[31] Measures to reduce the incidence of these infections may be beneficial from a cost and care-utilization standpoint. Investment in quality improvement has been shown to reduce overall Medicare expenditures by up to 38%.[32] In short, the cost of care is lower when patients do well.

Classification of wounds is typically the responsibility of the surgical team or operative nursing staff. Critically, studies have shown that SWC is frequently documented inaccurately.[33] Though a baseline incidence of SSI is anticipated, inaccurate documentation of SWC may lead to a significant deviation from expected rates of infection. Systematic under- or over-reporting could negatively influence hospital performance measures, reduce reimbursement, and may obscure the true risk profile of a procedure. Efforts to improve classification accuracy through nursing- and provider-driven interventions have been shown to be effective.[34–36] Though multiple interventions have been made within the scope of General Surgery procedures, we were unable to identify any specific efforts within OHNS. To date, there are no well-established guidelines for SWC in OHNS. As such, we aim to promote a number of basic tenets to allow for more consistent SWC assignments between providers. We propose a concise framework of SWC specific to Otolaryngology and based upon guidelines established by the Centers for Disease Control (CDC; Table 1).[3,4,37]

DISCUSSION

SSI has multiple risk factors. While SWC may be one,[38,39] there are numerous other factors that influence the rate of infection including diabetes mellitus, smoking status, obesity, immunosuppression, and other medical comorbidities.[4,6] As such, it is suggested that more than half of cases of SSI are preventable with appropriate focus on glycemic control, antiseptic prophylaxis, normothermia, and oxygenation.[40,41] In Otolaryngology, the risk for SSI has been found to be low in nonmajor surgery and endocrine surgery including thyroidectomy.[13] However, this risk is significantly increased with all major surgery involving nearly any anatomical subsite of the head and neck, including the aerodigestive tract, paranasal sinuses, ear, salivary glands, larynx, or facial bones.[13,42]

A number of national organizations have made efforts to measure and report SSI toward the goal of improving surgical quality. The National Safety and Quality Improvement Program (NSQIP) is a hospital-based initiative that allows facilities to track a variety of 30-day risk-adjusted surgical outcomes. For a select set of common surgical procedures, NSQIP tracks more than 130 variables including mortality, complication rates, pneumonia, unplanned intubations, renal failure, urinary tract infection, pulmonary embolism, and SSIs.[10,43] A unique report of expected versus observed outcomes helps a hospital see their performance within a greater regional and national context. For many years, SWC was included in these data extracted from medical records by NSQIP. This recently changed in January 2021, when SWC was removed by NSQIP as a variable of interest because of its low impact on risk-adjusted models.[44]

Similarly, the National Healthcare Safety Network (NHSN), managed by the Centers for Disease Control and Prevention, is a widely used infection tracking system.[45] Like NSQIP, NHSN also utilizes a risk-adjusted metric called the standardized infection ratio

TABLE 1 Centers for disease control guidelines for surgical wound classification

Wound class	Definition
Class I: Clean	• Uninfected operative wounds made under ideal conditions • No inflammation • No entry into respiratory, alimentary, genital, or uninfected urinary tracts • No lapse in sterile technique • Primary wound closure • Closed drainage
Class II: Clean-contaminated	• Entrance into mucosalized tissue under controlled conditions (respiratory, alimentary, genital, or urinary tract) • No unusual contamination by foreign body • No evidence of infection or major break in sterile technique
Class III: Contaminated	• Open or fresh accidental wounds • Operations with major breaks in sterile technique • Gross spillage from the gastrointestinal tract • Any acute, nonpurulent inflammation
Class IV: Dirty/infected	• Old traumatic wounds with retained devitalized tissue • Existing clinical infection or purulence • Environmental debris • Perforated viscera

Note: Adapted from Garner.[3]

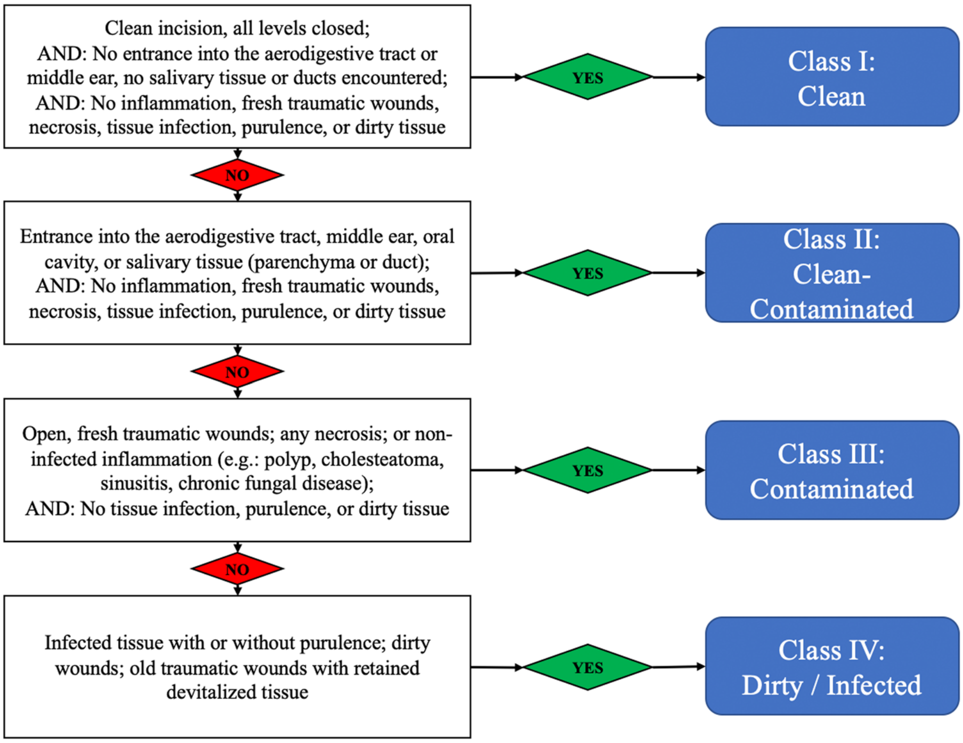

FIGURE 1 Surgical wound classification guideline for Otolaryngology—Head & Neck Surgery

(SIR) to track central line infections, mucosal barrier injury, catheter-related infections, ventilator-associated events, and SSIs.[46,47] Additionally, NHSN tracks a limited number of Otolaryngology-related operative procedure categories including "neck" and "thyroid and/or parathyroid" surgery. Also, like NSQIP, the NHSN SIR does not include SWC as a variable for most procedure categories. In the NHSN current model for neck cases, "procedure duration" is the only relevant predictor, while for thyroid cases the only predictors are "institution size" and "teaching affiliation."[47]

It is probably not a coincidence that SWC is no longer used in both NHSN and NSQIP's multivariate risk-adjustment models. While it is feasible that the influence of SWC on SSI is overshadowed by patient-mediated factors such as diabetes, smoking, and immunodeficiency, or other surgical factors like anatomic location, depth or size of field, operative time, and hematoma incidence,[4] another likely explanation is data inconsistency. It is reasonable to speculate that user error and systematic misclassification between different providers and institutions create unreliable wound classification data for common procedures, rendering this metric inert and hindering accurate quality improvement.[33,35,48] The value to be gained by accurate and transparent reporting of SWC has been demonstrated in a General Surgery study. Improved accuracy and consistency in SWC documentation led to a substantial change in perceived outcomes and interpretations of performance measures.[49] Though not currently utilized, SWC may be reintroduced into risk adjustment models if found to meet significance after future review.

We identified several areas in OHNS as sources of discrepancy in SWC. For example, in otologic surgery, the middle ear is in communication with the nasopharynx and respiratory tract via the eustachian tube. Surgery involving a healthy middle ear, when characterized properly, should be clean-contaminated (Class II). However, when the remainder of the surgical field is sterile, such as during a translabyrinthine approach to the cerebellopontine angle, these cases may be easily miscategorized as Class I (clean). Another illustrative example is encountered with parotidectomy or similar salivary surgery, where ductal ligation or violation of gland parenchyma places the surgical field in communication with the oral cavity, meeting Class II criteria. Again, many providers may improperly categorize these procedures as clean cases given their lack of a direct intraoral component. Last, in sterile ablative head and neck cancer surgery, providers may vary in their classification of surgical fields with necrosis or postirradiative noninfected inflammation. As a result of poor wound healing and fibrosis, the risk of SSI may be increased in these cases,[12,18,50–55] though other studies have not found this to be true.[13,15,16,56–59] If the risk of SSI is truly greater in these instances, a revision to their SWC may be warranted. These examples highlight the shortcomings of the current state of wound classification assignment in OHNS and underscore the need for an accepted, reliable, and reproducible wound classification algorithm.

Despite the fact that there are known discrepancies in SWC assignment, improvements can be made to this system. Efforts have been successful in other surgical disciplines to educate practitioners and improve consistency in wound classification. Devaney and Rowell[34] introduced an education series within their hospital to improve SWC accuracy, which led to a 26% decrease in misclassification. Chupp and Edhayan,[36] by posting a wound classification algorithm in the operating room, improved concordance between operative and nursing staff by approximately 50%–70% for select procedures. While efforts have been made in General Surgery and other specialties to build consistency and alignment with SWC as defined by CDC, little has been done in the Otolaryngology space to improve inter-rater reliability of assigned SWC. To meet this need, the authors created a generic algorithm to classify commonly encountered surgical wounds in OHNS in an effort to start the conversation around wound classification in our field (Figure 1).

As a matter of quality improvement, greater accuracy in wound classification may have a long-lasting positive impact on patient care both in terms of quality and cost. It is already the case that SWC holds influence over medical decision-making, for example, in determining perioperative antibiotic dosing. While Class I wounds, such as sterile neck dissection or thyroidectomy, usually do not require antibiotics beyond the intraoperative period.[60] Similarly, studies have shown no benefit to antibiotics beyond 24–48 h postoperatively for clean-contaminated wounds, such as in oral cancer resection.[61–63] More accurate SWC will better inform the risk of SSI for specific procedures, helping to better establish expectations, guide prophylactic treatment, and improve antibiotic stewardship.

As medical systems become increasingly quality-driven, care payments and reimbursement may soon also be influenced by the risk or incidence of SSI based on the SWC for a given procedure. Though to our knowledge at the time of writing this manuscript NHSN data does not currently affect care payment for OHNS-specific cases and is not collected by insurance companies, we can foresee an incentive-based system reliant upon both SWC and SSI. Providers who outperform expectations with lower than expected rates of SSI could be reimbursed at a greater rate, thereby reducing costly hospital length of stay while encouraging improved quality of care. Alternatively, procedures with higher expected risk of SSI based on their SWC could be reimbursed at a greater rate to account for the increased expected cost and complexity of treatment. To properly inform these quality-based models, it is paramount that we develop a common language and reliable framework for defining and categorizing the types of surgical wounds encountered in our specialty.

While the authors envision numerous benefits of consistent and accurate SWC assignment, these claims may be overstated. With greater accuracy of documentation, we may find that the use of wound classification is simply irrelevant, or, perhaps more likely, plays only a minor part in a multifactorial system of risk assessment. Until we develop a universally applicable, consistent, and accurate system for SWC in OHSN, it is unlikely that its potential value as a quality metric will be understood.

CONCLUSION

We present an issue at hand in Otolaryngology—Head & Neck surgery stemming from the inconsistency in provider-assigned surgical wound class. The ambiguity of SWC as applied to common OHNS cases, we believe, has created an unreliable system, which cannot be used to derive meaningful conclusions about patient care, risk assessment, or system-wide performance. We present an easily adopted guideline for improved accuracy of SWC in OHNS and offer discussion points for an evolving dialog aimed toward improving consistency in SWC assignment amongst providers and institutions.

AUTHOR CONTRIBUTIONS

Jeffrey D. Bernstein, MD assisted with project design, drafted the manuscript, and revised the manuscript. David J. Bracken, MD assisted with revising of the manuscript. Shira R. Abeles, MD assisted with revising of the manuscript. Ryan K. Orosco, MD assisted with project design and revising of the manuscript. Philip A. Weissbrod, MD conceived the project design and assisted with revising of the manuscript.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

There was no data collected for this study.

ETHICS STATEMENT

This body of work did not involve live subjects and did not require approval from the Institutional Review Board.

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