Reducing Oral and Maxillofacial Surgery Resident Risk Exposure: Lessons from Graduate Medical Education Reform


Abstract: It is estimated that, in the United States, more than 40,000 patients are injured each day because of preventable medical errors. Although numerous studies examine the causes of medical trainee errors and efforts to mitigate patient injuries in this population, little research exists on adverse events experienced by oral and maxillofacial surgery (OMFS) residents or strategies to improve patient safety awareness in OMFS residency programs. The authors conducted a retrospective literature review of contemporary studies on medical trainees’ reported risk exposure and the impact of integrating evidence-based patient safety training into residency curricula. A review of the literature suggests that OMFS residents face similar risks as medical trainees in medical, surgical, and anesthesia residency programs and may benefit from integrating competency-based safety training in the OMFS residency curriculum. OMFS trainees face particular challenges when transitioning from dental student to surgical resident, particularly related to their limited clinical exposure to high-reliability organizations, which may place them at higher risk than other medical trainees. OMFS educators should establish resident competence in patient safety principles and system improvement strategies throughout the training period.

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Patient safety and the mitigation of preventable medical errors is a national health care imperative. It is estimated that, in the United States, more than 40,000 patients are injured each day because of preventable medical errors. Each year, an estimated 1.5 million patients are injured, and approximately 98,000 die from avoidable medical errors. Twenty-seven percent of these medical errors involve medical trainees, one-third of which result in patient death. In a retrospective study examining twenty years of malpractice data, Singh et al. reported lack of supervision, judgment errors, ineffective teamwork, and lack of technical skills as the leading causes of medical trainee errors. Frequent handoffs and transitions of care, communication barriers, poor information exchange, interruptions, and limited faculty supervision are consistently cited as major causes of trainee error. Fifty-five percent of medical trainees report involvement in medical errors, citing excessive work hours, inadequate supervision, and problems with handoffs as precursors to adverse events. Residents perceive teaching hospitals that fail to protect against error “traps” that amplify human fallibility and opine that medical trainee errors could be prevented with increased faculty supervision, improvements in communication and teaming skills, and procedural training.

Preventable errors involving medical trainees can be mitigated by offering patient safety programs designed to improve teamwork and communication, hazard identification, and error analysis strategies during the medical training period. Contemporary research suggests that evidence-based patient safety training decreases adverse events including patient morbidity and mortality and improves job satisfaction, operational efficiency, teamwork, and communication. Despite these findings, little research exists on the incidence or types of adverse events involving oral and maxillofacial surgery (OMFS) residents and strategies to reduce OMFS resident risk exposure or describe efforts to improve patient safety in OMFS residency programs.

Based on an extensive review of the literature, we hypothesize that OMFS residents are exposed to
the same risk of error occurrence as practicing oral and maxillofacial surgeons throughout the training period and suggest that OMFS residents may experience significant risks during the twelve months of off-service rotations in general surgery, internal medicine, and anesthesiology. The purpose of this review was to synthesize the most common causes of preventable errors reported in oral and maxillofacial surgeons and medical trainees and explore contemporary efforts to improve patient safety in academic medicine. These findings may support the integration of competency-based safety training in OMFS residency curricula that aligns with medical education reform.

Preventable Medical Errors in OMFS

Oral and maxillofacial surgeons represent only 5 percent of the total dentist population (N=6,700) and 1 percent of the U.S. physician-dentist population.20,21 According to the Oral and Maxillofacial Surgeons National Insurance Company (OMSNIC), approximately 1,200 wrong site extractions have occurred since 1988, with a reported incidence rate increase of two percentage points in 2010, accumulating over $19 million in settlement costs. In addition, over $30 million in malpractice settlements for preventable nerve injuries from lower third molar extraction and implant placement is reported.22,23 Unfortunately, malpractice data on the approximately 2,400 oral and maxillofacial surgeons not insured by the OMSNIC are unknown and can only be generalized from information extracted from the National Practitioner Data Bank. No data exist on the incidence of medical errors in OMFS residents.

According to Lee et al., wrong site extractions are the primary reason for malpractice suits against oral and maxillofacial surgeons.24 The Joint Commission Sentinel Event Alert reported that “14% of wrong body part or site surgery was related to dental/oral maxillofacial, cardio-vascular-thoracic, ear-nose-throat, and ophthalmologic surgery” (p. 1794).24 Similar results were reported in international studies. Healy et al. studied the occurrence of wrong site surgery in the United Kingdom and reported that trauma and orthopedic surgeons incur the greatest occurrence (28 percent) followed by dental surgeons (16.8 percent).25 In this study, wrong-site surgery was defined to include wrong patient, wrong site prosthesis, wrong side, wrong side block, wrong site listed on OR schedule, and wrong site marked on consent forms. Healy et al. concluded that surgical specialties characterized by high-volume loads and major technical complexity have a higher propensity for error and must rely on effective teamwork and communication.

Multiple causative factors contribute to the occurrence of preventable wrong-site errors: likeness of site and procedure, similarity of patients’ names, breakdown in teamwork and communication, failure of existing safety checks, and lack of regulatory oversight in the outpatient setting.26 Seiden and Barach indicated that wrong-side/wrong-site, wrong patient, wrong procedure events will continue to increase in the ambulatory setting, particularly in areas using conscious sedation such as radiology and advanced dental specialty clinics.26

Review of the Literature

Communication failure and ineffective teamwork are the leading causes of surgical error,25,27-30 which has been validated in the contemporary OMFS literature.24,31,32 Factors contributing to communication failure are cultural barriers existing in demagogic hierarchies, differences in training,25 ineffective team interaction,25 and inadequate information exchange between surgeons and patients, nurses, residents, and other physicians.33 According to Healy et al., contextual, technological, and procedural factors cause communication to fail.25

Cognitive failure during oral surgery has been attributed to preventable errors.24,31,32 Paleg et al. analyzed the events precipitating wrong site extractions in fifty-five malpractice claims between 1993 and 2004, citing errors during treatment (cognitive failure) and poor communication between clinicians as the leading cause of oral surgery errors.32 Similarly, Chang et al. and Lee et al. reported cognitive failure and poor communication as major contributors to wrong site extractions.24,31 Lee et al. asserted that miscommunication between oral surgeons, referring dentists, patients, and surgical team members was the leading cause for wrong site extractions.24 Error prevention strategies such as human factors training, development of clinical guidelines, and mandatory use of universal protocols have reduced wrong site extractions.24,31 Despite these recommendations, strategies to mitigate other risks in OMFS residency programs remain undocumented in the literature.24
Medical Education Reform

Since 2003, medical education reform has mandated the integration of patient safety training in medical school curricula and Accreditation Council for Graduate Medical Education (ACGME) standards that require demonstrated competence in the scientific principles of patient safety for all graduate medical education trainees. Medical education reform and curriculum standards that improve knowledge, safety attitudes, and competencies needed to render safe, quality patient care are theorized to reduce the incidence of preventable medical errors and “near miss” events.

Medical trainees in high-risk environments are vulnerable to medical errors caused by human factors and systems failure, especially those related to teamwork, technical skill level, judgment, and lack of supervision. Oral and maxillofacial surgery residents train in the same high-risk environments during their clinical rotations in oral surgery, anesthesia, general surgery, internal medicine, emergency medicine, critical care, and trauma services. Exposure to highly complex systems makes OMFS residents vulnerable to the same threat of error occurrence reported in other medical, surgical, and anesthesia residency programs; they may thus benefit from receiving the same patient safety training offered to these medical trainees.

Medical Trainee Risk Exposure

Sorokin et al. conducted a study on resident attitudes about patient safety and risk exposure to gain understanding of residents’ perception of adverse events, who was responsible, and how errors could be prevented. Lack of supervision, technical skill, teamwork, and poor information exchange during handoffs and “sign-outs” were cited in their report as major factors leading to trainee error.

SoRelle cited frequent handoffs and transitions of care, limited attending supervision, communication barriers, poor information exchange, and interruptions as major causes of medical trainee error. According to Schumacher et al., inadequate faculty supervision was directly related to medical errors. Treatment plans were more effective, and patient outcomes improved with direct faculty supervision when compared to non-supervised care. In a separate study, Abraham et al. found that failure of accurate information exchange during resident sign-outs and handoffs led to medical errors. These failures were attributed to content omissions, lack of face-to-face communication, failure to complete treatment plan, information loss, and ambiguity of information. Horwitz et al. asserted that the omission of key information during transitions of care led to adverse events, near misses, inefficiencies, and duplication of work.

Solet et al. alluded to the impact of ACGME eighty-hour duty restrictions on increased handoffs between medical trainees and medical errors. The frequent exchange of patient responsibility between trainees was thought to increase the variability, inaccuracy, and unreliability of clinical information. According to these researchers, the preferred method for sign-outs and handoffs is face-to-face rather than asynchronous communication. Direct communication was found to reduce ambiguities, provide an effective exchange of information, and enable the receiver to ask questions.

Dunn and Murphy postulated that two major types of resident communication failure exist: omitted content and failed processes. Communication processes such as phone, e-mail, and computerized records reduced face-to-face communication and were perceived as a major factor in communication failure. Ash et al. emphasized that asynchronous or computerized technology reduced direct interaction and replaced prior methods of communication, resulting in less feedback, order confirmation, and reduced order accuracy.

Rivera and Karsh reported that interruptions and distractions were a major cause of errors in surgical teams. These errors resulted from workload interference, cognitive failure, task incompletion, and inattention. Sevdalis et al. cited a linear relationship between interruptions and error rates in surgery, while Wiegman et al. reported that the likelihood of error increased when interruptions and distractions caused surgeons to shift attention away from the primary task.

Aboumatar et al. contend that the major contributor to preventable patient harm is the lack of graduate medical education safety training programs designed to improve teamwork and communication, hazard identification, and promote evidence-based practice. Jansma et al. examined resident recommendations for effective patient safety training and found that a) courses should occur at the beginning of the residency, b) frequent refresher courses should be offered, c) course content should be integrated with clinical practice, and d) staff and faculty should be
required to complete similar training. Ellis alleged that patient safety training must occur upon arrival to the residency before residents are influenced by negative safety cultures and prevailing opinions. Flin et al. suggested that the optimal approach to evaluate the effectiveness of patient safety training should include a measurement of knowledge and attitudes following this intervention.

**Implications for OMFS Resident Education**

Oral and maxillofacial surgery trainees face unique challenges when transitioning from dental student to surgical resident when compared to medical trainees. First, these novice residents have limited clinical exposure to high-risk environments such as teaching hospitals and ambulatory clinics unlike medical trainees who rotated through these facilities as medical students. These OMFS residents may be at greater risk because of their lack of clinical exposure and understanding of the complexities inherent in these systems. Rogers et al. reported that the majority of surgical resident errors are caused by system failures. System factors such as organizational culture, team design, operating procedures, technological infrastructure, and faculty supervision affect medical trainee performance.

Second, we hypothesize that novice OMFS residents may not have the same medical knowledge, clinical decision making skills, or technical expertise as their medical school colleagues entering internal medicine, surgery, and anesthesia residency programs. Although OMFS residents gain requisite medical knowledge over the training period, differences exist in the dental and medical school basic science curricula that may impact the performance of novice residents. Lack of knowledge and skill has been documented as a major cause of resident error. Institutional and social factors pose the greatest threat when combined with limited knowledge on the interaction of human cognition and behavior in high-risk environments. According to Singh et al., residents with medical knowledge gaps are more vulnerable to committing errors, requiring more supervision and team support due to their lack of clinical experience and technical expertise. Inadequate faculty supervision in this population is directly related to resident errors and adverse patient outcomes.

**Conclusion and Recommendations**

Similarities exist in the causes of preventable medical errors reported for oral and maxillofacial surgeons and medical trainees: cognitive failure, interruptions and distractions, breakdown in communication, and poor teamwork. If the Commission on Dental Accreditation adopts the ACGME eighty-hour duty restrictions, OMFS residents will face additional risks associated with the collateral effects of increased transitions of care reported in academic medicine: inadequate and inaccurate information exchange between resident/faculty teams, decreased faculty supervision, omissions in care, and failure to complete treatment plans. Therefore, we must assist OMFS residents in meeting these challenges by providing the tools that will increase their awareness of inherent risks in high-reliability systems, improve teamwork and communication, and develop error identification and analysis skills.

Toward that end, we make four recommendations. First is to integrate competency-based patient safety programs that are relevant for advanced dental specialty trainees as an adjunct to generic hospital programs intended for a wide audience of employees. Interventions such as Crew Resource Management (CRM), TeamSTEPPS, Institute for Healthcare Improvement (IHI) Open School, and World Health Organization (WHO) patient safety programs provide evidence-based safety training for advanced-practice health professionals, with reported improvements in patient outcomes, communication, teamwork, and a reduction in adverse events and medical errors following training. Second, patient safety training should commence prior to OMFS residents’ clinical exposure to high-risk environments to advance knowledge and self-efficacy and should continue throughout the residency training period to sustain awareness. Third, knowledge gained from patient safety training must occur upon arrival to the residency before residents are influenced by negative safety cultures and prevailing opinions. Flin et al. suggested that the optimal approach to evaluate the effectiveness of patient safety training should include a measurement of knowledge and attitudes following this intervention. Fourth,
further research on the incidence of preventable errors, error prevention strategies, and the impact of competency-based safety training on morbidity and mortality rates in OMFS residency programs should be conducted.

Contemporary research suggests that safety training based on human factors and system engineering theories decreases adverse events including patient morbidity and mortality and improves job satisfaction, operational efficiency, teamwork, and communication. Despite these findings, little research exists on patient safety training in advanced dental specialty education and, in particular, strategies to reduce oral and maxillofacial surgery residents’ risk exposure. The occurrence of preventable medical errors in oral and maxillofacial surgery is evidenced by data obtained from the Oral and Maxillofacial Surgeons National Insurance Company and the National Practitioner Data Bank. Although the severity of these errors may not equate to the morbidity and mortality rates found in medicine, any potential for error that leads to patient harm must be mitigated regardless of the severity of patient outcomes. The Lucian Leape Institute reports that current interventions to reduce the rate of medical errors are ineffective and suggests this epidemic could be significantly curtailed by integrating competency-based patient safety training in graduate medical education and residency training curricula.

Medical education reform mandated the integration of patient safety training in medical school curricula and ACGME standards that require demonstrated competence in the scientific principles of patient safety for all graduate medical education trainees. Similar initiatives should be considered for dental and advanced dental specialty education. It is the responsibility of oral and maxillofacial surgery educators and sponsoring institutions to guarantee safe care for patients who participate in OMFS resident education. The need to communicate the importance of patient safety and motivate resident ownership for improving patient safety should be a high priority for all OMFS residency programs. As OMFS educators, we must ensure that residents are taught how to provide safe care throughout the training period by establishing resident competence in patient safety principles and system improvement strategies that align with our academic colleagues in graduate medical education. In doing so, we may minimize resident risk exposure and reduce the incidence of preventable medical errors in the next generation of oral and maxillofacial surgeons.

REFERENCES


