

# Quality Resource Guide

## Avoiding Errors in Dental Practice

### Author Acknowledgements

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### Educational Objectives

Following this unit of instruction, the learner should be able to:

1. Understand the history of medical errors and their current developments.
2. Describe key patient safety terminology.
3. Describe the methods to assess patient safety culture in an organization.
4. Describe a dental adverse event classification scheme and severity scale.
5. Discuss the benefits of using a systems-based approach to improve patient safety.
6. Discuss various strategies and tools to minimize/eliminate errors from the dental practice.

MetLife designates this activity for **1.0 continuing education credits** for the review of this Quality Resource Guide and successful completion of the post test.

The following commentary highlights fundamental and commonly accepted practices on the subject matter. The information is intended as a general overview and is for educational purposes only. This information does not constitute legal advice, which can only be provided by an attorney.

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## Introduction

While the overarching goal of providing dental care is to improve the oral health status of patients, sometimes patients are inadvertently harmed. Patient safety is a field dedicated to minimizing iatrogenic harm to patients. Work in medicine has demonstrated that healthcare is one of the least safe industries.<sup>1,2</sup> Medical adverse events (AEs) are one of the leading causes of death in the US,<sup>3</sup> (Figure 1) (although the exact magnitude is not always agreed upon)<sup>4</sup> and has gained prominent attention from academic, healthcare, and government institutions and organizations.<sup>5-7</sup>

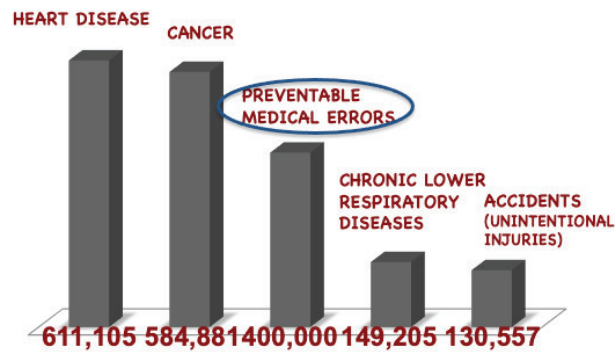
Realization of medical errors dawned in 1991 with the publication of the Harvard Medical Practice Study results.<sup>8</sup> The publication of the 2000 Institute of Medicine report, *To Err is Human* truly helped bring patient safety into the medical and public consciousness.<sup>9</sup> The Institute of Medicine (renamed The National Academy of Medicine) stated that patient safety improvement encompasses three activities: preventing AEs, making AEs visible, and mitigating the effects of AEs.

Medicine has made significant inroads using a multitude of approaches focusing on system-wide strategies rather than punitive measures.<sup>1,10,11</sup> There has been a patient safety revolution in both in-patient and out-patient medicine since the release of that report. Dentists, like physicians, routinely perform highly technical procedures in complex environments, work in teams, and use a multitude of devices and tools. The dental profession has recently begun to focus on assessing and improving patient safety.

## Types of harms in dentistry

Before patient safety in dentistry can be improved, oral healthcare providers must recognize that there is a problem to be solved. There is a mounting body of evidence that some patients are harmed in the dental chair. Sometimes these harms are reported in news media, such as when a child dies after receiving sedation. However, most harms to patients are not widely publicized but can be found in published case reports in the literature, disciplinary reports to state boards, reporting systems, or data mining from patient charts.

Figure 1 - Leading causes of death in the United States



Source: Centers for Disease Control and Prevention

Language is important when building a culture of patient safety. **Table 1** provides an overview of the language of patient safety.

The National Academies of Medicine defines healthcare quality as “the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge.”<sup>12</sup>

An example of significant harm that can occur in dental practice involves the use of a high-speed handpiece. The high-speed dental handpiece is often used with a diamond-coated bur, which rotates at up to 400,000 revolutions per minute<sup>13</sup> in close proximity to the patient’s lips, tongue, and throat. It should be no surprise to discover numerous published case reports of severe lacerations and other injuries.<sup>14</sup>

Within the FDA’s database of medical device failures, there are 28,046 reports of injury involving a dental device over 15 years.<sup>15</sup> Many other harms may occur in the dental office, including aspiration,<sup>15</sup> edema due to sodium hypochlorite extrusion,<sup>16</sup> and a sublingual venous thrombosis due to a laceration caused by a rotating dental handpiece.<sup>17</sup> Reports, both in the literature and in the FDA database of medical device failures database, also describe deaths associated with dental treatment.<sup>15</sup> In extensive patient chart reviews, there are many instances of serious AEs following surgical dental procedures, including an adjacent tooth inadvertently being dislodged, a

patient being found to be non-responsive to verbal cues and transferred to the ER, and lip numbness due to nerve injury lasting weeks. The most common types of dental AEs discovered through chart reviews include unexpected post-surgical pain, hard tissue injury (tooth perforation) and soft tissue injuries (lacerations).<sup>18</sup>

## The link between human error and patient harm

In ‘Crossing the Quality Chasm’, the Institute of Medicine pointed out that “The biggest challenge to moving forward toward a safer health system is changing the culture from one of blaming an individual to one in which errors are treated not as personal failures, but as opportunities to improve the system and prevent harm.” The idea that underlying systems, not people, cause the majority of errors has proven to be fundamental in high-hazard industries but is also increasingly applicable to health care, including dentistry.

To make dental care safer, we must use a variety of suitable tools and develop processes to engage the system as a whole.<sup>19</sup> A system is defined as a set of interacting components (structures, people, and processes) that work together toward a common goal.<sup>20</sup> Importantly, we suggest that due to the inherent complexity of providing dental care, “interventions that do not consider issues across the whole system, including organizational factors, are unlikely to have significant, sustainable impact on patient safety and quality of care.”<sup>21</sup>

The Systems Engineering Initiative for Patient Safety<sup>21,22</sup> framework helps to understand the socio-technical work system we work in (people, tasks, tools/technologies, physical environment, and organization) and its work processes. **Figure 2** places the Systems Engineering Initiative for Patient Safety model into the standard time frame of patient care and is a valuable framework to consider for improving dental patient safety.

### Strategies to avoid harm in practice

To assess and sustain patient safety in any organization, comprehensive strategies are needed that include engagement of all stakeholders, evaluation of the existing safety culture, identification of specific harms, and use of tools to help minimize them.<sup>23-25</sup> Most importantly, without conscientious and involved leadership sustainability of these strategies is impossible.<sup>26</sup>

#### Strategy 1

##### Assess safety culture in your practice

Understanding the safety culture within one’s practice empowers it to undergo a proactive cultural shift that will reduce the risk of adverse events. Fundamental to this evolution is the emergence of a positive safety culture, which is “the product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, an organization’s health and safety management.” Within the health care setting, these assessments can be used to diagnose safety culture, identify areas for improvement, and raise awareness about patient safety.<sup>27</sup>

Dental practices may consider using the Medical Office Survey on Patient Safety Culture sponsored by the Agency of Healthcare Research and Quality.<sup>28, 29</sup> The survey was designed specifically for the

**Table 1 - Language of Patient Safety**  
(selected concepts and their definitions from WHO’s Patient Safety Curriculum Guide)

<b>Adverse event:</b> an <i>incident</i> in which a patient is <i>harmed</i> . (See ‘incident’ and ‘harm’ definitions below for further understanding)
<b>Contributing factor:</b> a circumstance, action or influence that is thought to have played a part in the origin or development of an incident or to increase the risk of an incident.
<b>Culture:</b> language and customs, as well as values, beliefs, behaviors, practices, institutions and the ways in which people communicate.
<b>Degree of harm:</b> the severity and duration of <i>harm</i> , and any treatment implications, that result from an <i>incident</i> .
<b>Error:</b> failure to carry out a planned action as intended or application of an incorrect plan.
<b>Event:</b> something that happens to or involves a patient.
<b>Evidence-based:</b> to apply the best available evidence gained from a scientific method to clinical decision-making.
<b>Harm:</b> impairment of structure or function of the body and/or any deleterious effect arising therefrom. Harm includes disease, injury, suffering, disability and death.
<b>Incident:</b> an event or occurrence that may cause or causes an interruption or a crisis. In safety, an incident of workplace illness or injury.
<b>Near miss:</b> an <i>incident</i> that did not reach the patient.
<b>No harm incident:</b> an <i>incident</i> that reached a patient, but no discernable <i>harm</i> resulted.
<b>Patient safety:</b> the reduction of risk of unnecessary <i>harm</i> associated with health care to an acceptable minimum.
<b>Quality improvement:</b> any process or tool aimed at reducing a quality gap in systemic or organizational functions.
<b>Risk:</b> the probability that an <i>incident</i> will occur.
<b>Root Cause Analysis (RCA):</b> is a defined process that seeks to explore all of the possible factors associated with an incident by asking what happened, why it happened and what can be done to prevent it from happening again.
<b>Safety:</b> the reduction of risk of unnecessary <i>harm</i> to an acceptable minimum.
<b>Sentinel Event:</b> an “ <i>adverse event that should never be allowed to happen</i> ”, is usually unexpected and involving a patient’s death or serious physical or psychological injury to a patient.

outpatient health care setting in order to question providers and staff about their views regarding the culture of patient safety and health care quality in their clinics. The Medical Office Survey on Patient Safety Culture includes thirty-eight items measuring ten composites of patient safety culture. Fourteen additional items measure other patient safety and quality issues and problems with exchanging information with other settings. It asks providers and staff for their opinions regarding the culture of patient safety and health care quality in their medical offices. We have administered the questionnaire in dental clinical and academic settings and have found eye-opening results. For example, 15% of respondents felt that the systems and processes to prevent or catch patient problems were only fair or poor; 29% of respondents did not feel they have enough staff to handle the patient load; 24% felt that it was difficult to voice disagreement, and 51% felt rushed taking care of patients. Indeed, our findings consistently demonstrate that the patient safety culture in dentistry is worse across many measures than results the Agency of Healthcare Research and Quality published for outpatient medical offices,<sup>30</sup> indicating the pressing need to advance patient safety in dentistry. We have administered this survey multiple times at academic dental schools to evaluate interventions and track any changes in the safety culture.

**Strategy 2**

**Chart reviews to identify threats to patient safety**

A retrospective review of patients' health records is a useful approach for systematically identifying and measuring harm. It is not time-efficient to audit all patient charts, so a random sample is often selected for review. Due to the small yield using this approach, the Institute for Healthcare Improvement developed the strategy of employing global trigger tools<sup>30,31</sup> to identify charts that are more likely to contain

Figure 2 - SEIPS model with treatment timeline

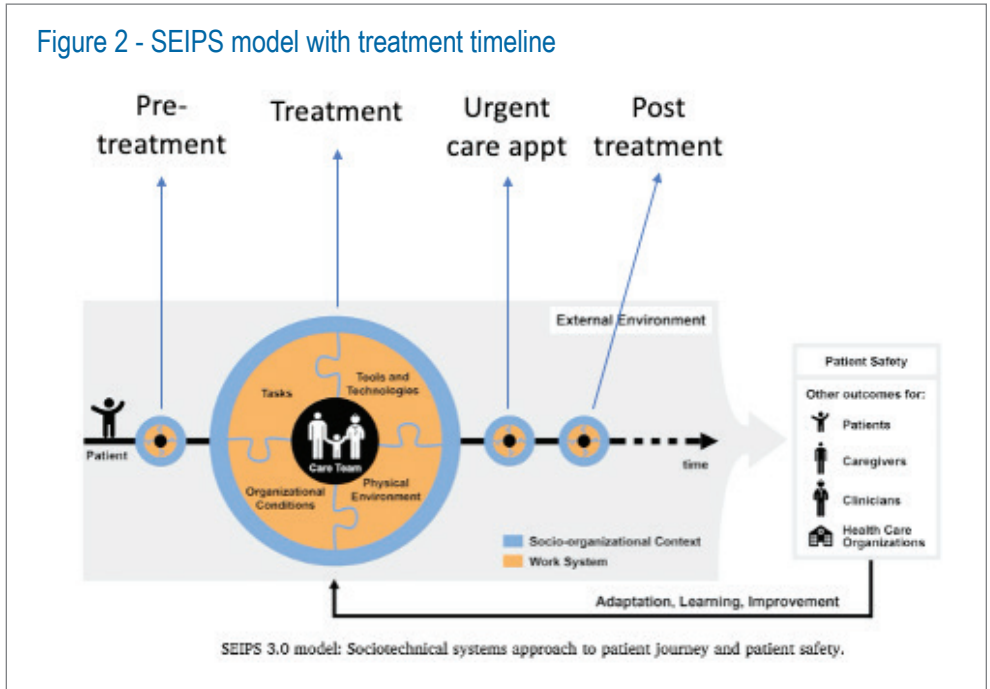
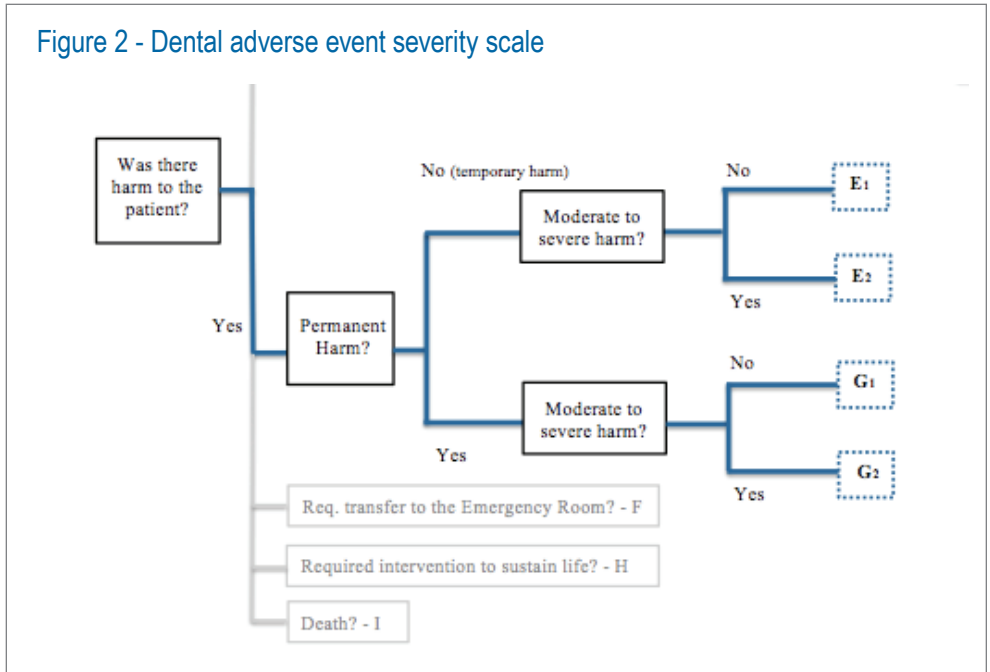


Figure 2 - Dental adverse event severity scale



an AE. Dental trigger tools can be used by practices interested in measuring their AE rate. Triggers can be implemented and run against the institutional electronic health record. The triggers can mostly rely on structured data, such as dental procedure codes and medications documented to be taken by the patient. Some triggers may also search for keywords in the clinical notes, such as “paresthesia” to find

nerve injuries. Based on our prior experiences,<sup>32</sup> we have developed the logic to identify common dental AEs that can be categorized based on: 1) the type of AE using a list of eleven items (see Table 2), and 2) severity using a 5-item scale (see Figure 3). We have found that pain, soft tissue, hard tissue and nerve injuries are the most common types of AEs. Researchers at the University of Edinburg have also identified

a set of “never events” which “are a subset of serious patient safety incidents that should not occur if appropriate preventive measures are implemented” for dentistry.<sup>33</sup> Examples of these never events include failure to register a patient’s history of medication allergies, providing treatment to the wrong patient, and wrong tooth extraction.<sup>33</sup> Practices may use routine chart reviews to consistently measure the presence of never events and other adverse events in their practice.<sup>18</sup>

After the identification of harm, it is essential to determine why these harms occur. Root Cause Analysis is a structured method widely used in healthcare to achieve this goal.<sup>34</sup> It is evidence-based and is meant to shift the mindset from blaming an individual for causing harm to identifying flaws in a system. Root Cause Analysis is a quality improvement tool that allows us to realize what happened, how the incident happened, and why it occurred. This tool helps us go beyond the surface symptoms, dig deeper and appreciate the underlying issues of an incident. Once we understand the true causes of the problem, we can make appropriate changes to prevent the reoccurrence of that AE and subsequently provide a safer environment for our patients.<sup>35-37</sup> For example, the following AE was discovered after a chart review:

*A fifty-three-year-old male patient presented to the clinic with pain in his lower left first molar tooth. The tooth was determined to need a root canal treatment due to pulpal necrosis (dying/dead nerve). An initial pulpotomy was performed and root canals were accessed. Approximately one month later, the patient returned and the root canal treatment was completed. After the root canal treatment, an abscess developed at the end of the root. The patient was then prescribed antibiotics (Clindamycin 300 mg). When the abscess did not resolve, a root canal re-treatment was planned and initiated two months after the initial root canal treatment. During re-treatment, a large perforation at the pulpal floor was detected and, due to the poor prognosis, the tooth was extracted.*

**Table 2 - Categorization of dental adverse events**

Adverse Event Category
Hard tissue injury
Soft tissue injury
Nerve injury
Pain
Infection
Bleeding
Aspiration/ingestion of foreign body
Wrong site/wrong procedure/ wrong patient
Allergy/toxicity/foreign body response
Other oro-facial harm
Other harm

After reviewing the patient’s chart and images, an as-is timeline is created for the incident showing the sequence of events in chronological order. Following this, a second timeline is created depicting the optimal or expected sequence of events to handle that specific condition. The expected sequence of events was not judgmental but rather evidence-based using references from the literature. A rationale is provided as to why the expected sequence of events would have been beneficial.

Finally, although the information from the electronic health record is limited to understand fully the work system factors involved, contributing factors are identified or proposed and classified using the Systems Engineering Initiative for Patient Safety model: 1) who was involved (Person), 2) what were they doing (Tasks), 3) what tools/technologies were they using (Tools/Technologies), 4) where did the event take place (Environment) and 5) what organizational conditions contributed to the event? (Organization).

Figure 4 shows a summary diagram listing potential causes, considering the different components of the Systems Engineering Initiative for Patient Safety model for the root canal and extraction case above. A Root Cause Analysis can therefore help identify potential areas that can be improved in the future.

### Strategy 3

#### Use checklists

Dental practitioners make on average two errors per day, with 1.4% of these errors leading to an adverse event that may include patient harm.<sup>38</sup> Safe systems have safety barriers in place rather than relying upon the providers to avoid making errors.<sup>9</sup> Checklists have become one of the salient tools in medicine to effectively improve safety, prevent errors and improve the use of best practices.<sup>39-41</sup> based on the principle that human error is inevitable.<sup>42</sup> According to Burian et al.,<sup>43</sup> checklists are used to:

1. “Aid memory/provide information
  - a. Support quick access of time-critical information
  - b. Support easy access to non–time-critical information
2. Facilitate decision making
3. Guide/direct/order step-by-step actions/considerations in real time
4. Facilitate/standardize communication/treatment/planning/information gathering across individuals or teams
  - a. Structure interactions among checklist users
  - b. Develop/ensure a shared understanding of a situation/patient’s status
5. Confirm that specific actions have been accomplished
6. Evaluate existing patient, task status or situation.”

Checklists have proven to be effective at improving the quality of patient care and preventing errors. Consequently, the World Health Organization in 2009 engineered a 'safe surgery' checklist and applied it around the world with staggering success.<sup>44</sup> Checklists now exist throughout medicine. These tools are increasingly being used to reduce errors of omission, create reliable evaluations and most pertinently, improve the quality and use of best practices.<sup>45,46</sup> Checklists in dentistry have been proposed for helping clinicians consider atypical causes such as malignancy for temporomandibular disorders,<sup>47</sup> preventing wrong tooth extractions,<sup>48, 49</sup> and for dental implant placement.<sup>50</sup>

## Strategy 4

### Use computerized clinical decision support systems

Computerized clinical decision support seeks to provide actionable information at the point of care.<sup>51</sup> Information needed to make decisions, if available, must be perceived, interpreted and often integrated from multiple sources. Cognitive barriers, such as memory failure, lack of knowledge, information overload, and the use of suboptimal strategies further constrain the accuracy of decision-making. We know from multiple randomized controlled trials that clinical decision support tools (1) are well-implemented, (2) employ pertinent patient data, (3) are derived from rich electronic health records, and (4) when well-integrated into the clinical workflow,<sup>52</sup> can produce significant and important improvements in care processes.<sup>51, 53</sup> For example, in dentistry, clinical decision support could help dentists prescribe antibiotics more appropriately. The clinical decision support could query relevant data from the electronic health record and present information indicating concordance or discordance with prescribing guidelines. If the dentist continues to prescribe a discordant antibiotic, they could

be asked to enter a written justification for the non-recommended prescription, which provides flexibility and accountability.

## Strategy 5

### Self-reflection through audit and feedback

Audit and Feedback is a well-established tool in healthcare for quality improvement.<sup>54-56</sup> Audit and Feedback summarizes the specific quality of care and patient safety data and feeds aggregated reports back to dentists to encourage change.<sup>55</sup> Regular feedback that includes peer-performance comparison will likely encourage dentists to take action.<sup>57</sup>

Audit and Feedback interventions have been effective in a wide variety of healthcare settings,<sup>58-60</sup> including prescription management.<sup>61,62</sup> With key information available in one place, dentists can review their performance, drill down into more detailed analyses, and identify problem areas that need attention.<sup>55,57,63-67</sup> Audit and Feedback summarizes specific data and feeds them back to practitioners to encourage change.<sup>55</sup> While few studies have been conducted in dentistry, compared to medicine, the Scottish RAPiD (Reducing Antibiotic Prescribing in Dentistry) trial provided general dentists with individualized graphical feedback of their antibiotic prescribing rate compared to other dentists and a message with an antibiotic guideline.<sup>68</sup> Dentists who received the Audit and Feedback reduced their antibiotic prescribing rates by 5.7% compared to a control group.

## Strategy 6

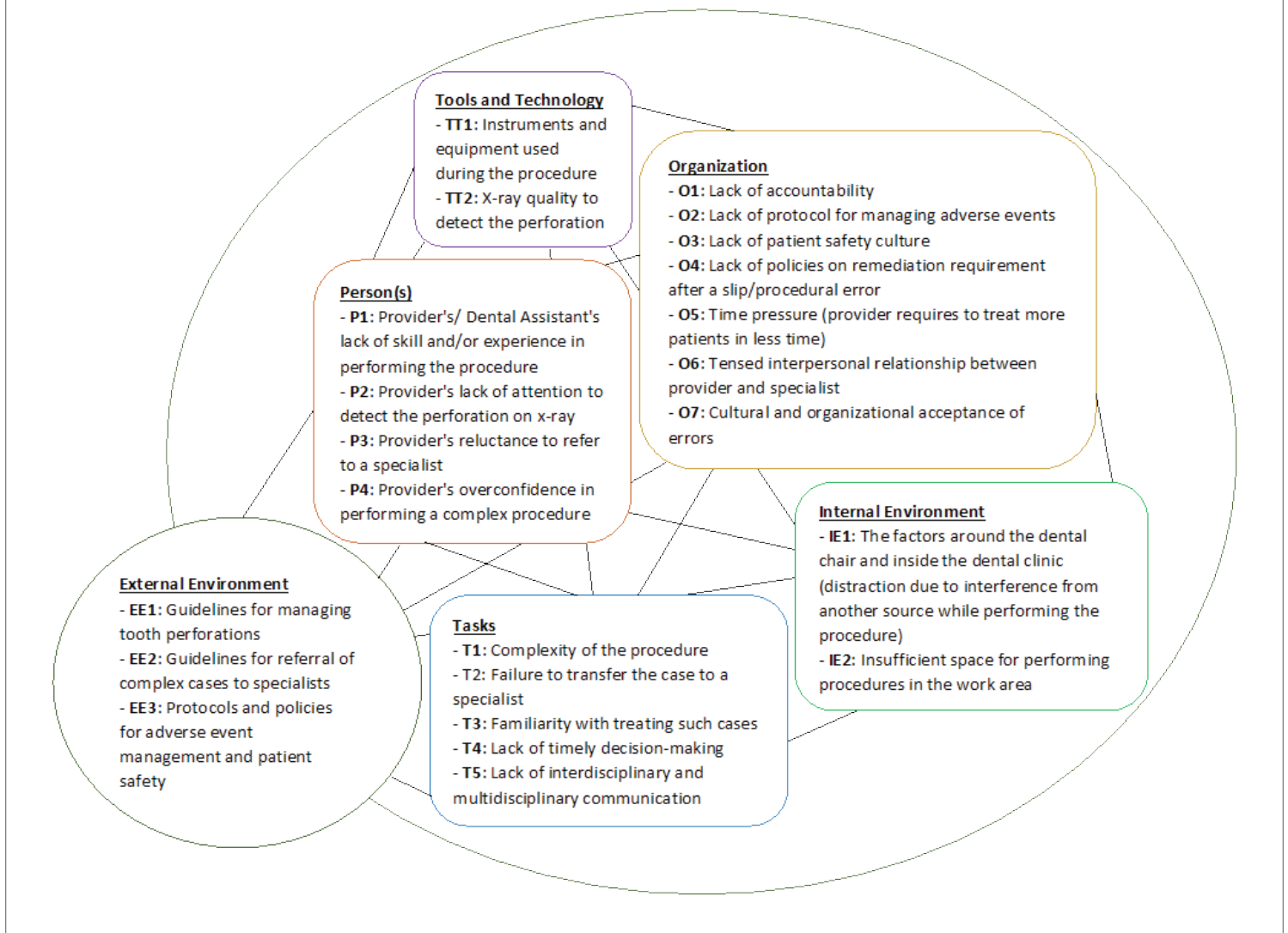
### Aspire to become a learning health system

The Agency for Healthcare Research and Quality defines a Learning Health System (LHS) as "a health system in which internal data and experience are systematically

integrated with external evidence, and that knowledge is put into practice. As a result, patients get higher quality, safer, more efficient care, and health care delivery organizations become better places to work."<sup>69</sup> While many healthcare organizations aspire to be learning health systems; few have achieved the main tenants of a learning health system. The need for a learning health system in dentistry is particularly acute due to the wide variation in patient care quality and safety. A learning health system can also help to more quickly translate high-quality evidence for preventing and treating dental disease safely into practice.<sup>70</sup> A learning health system requires that dental clinics adopt and use electronic health records and other health information infrastructure components that are essential building blocks. A dental clinic with these components can use routinely collected patient data from their electronic health record and generate knowledge regarding the current quality and safety gaps. The clinic or practice can then develop and iteratively test interventions to turn that knowledge into improving the system's performance.

Furthermore, the clinical team can implement the interventions, re-assess performance and use these data for further improvements to make dental care safer in the future. As part of a learning culture, it is also vital for dentists to routinely report safety events they encounter. The Dental Patient Safety Foundation ([www.dentalpatientsafety.org](http://www.dentalpatientsafety.org)), for example, is an independent non-profit that allows dentists to submit confidential or anonymous reports. As a listed Patient Safety Organization, reports sent to this entity are legally protected, and confidentiality is maintained for all disclosures. The Dental Patient Safety Foundation analyzes events they receive and provide reports back to the dental profession with recommendations to help improve patient safety.

Figure 4 - Contributing factors associated with tooth perforation



## Summary

Improving patient safety in dentistry requires a deliberate effort from the entire oral healthcare team. While there is increasing evidence to suggest that some patients may be inadvertently harmed as part of dental care, many strategies can be used to help mitigate these harms and make care safer. Increasing awareness, talking openly, and taking a systems approach (rather than blaming individuals) about adverse events will help to improve the safety culture in a dental office. Routine chart reviews identifying

adverse events and tracking the frequency of these events over time will help a practice recognize specific problems and provide a baseline measure that can be used for future improvements. Better use of electronic tools such as checklists, clinical decision support, and audit and feedback reports that provide actionable information may also help prevent or minimize patient harm. Moreover, dental offices can commit to becoming a continuous learning health system where data collected are routinely used, analyzed, reported, and findings shared to improve the safety and quality of dental care for all patients.

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## POST-TEST

Internet Users: This page is intended to assist you in fast and accurate testing when completing the “Online Exam.” We suggest reviewing the questions and then circling your answers on this page prior to completing the online exam.

(1.0 CE Credit Contact Hour) Please circle the correct answer. 70% equals passing grade.

1. **An adverse event in health care is an incident in which a patient is harmed due to an underlying disease rather than from medical care.**
  - a. True
  - b. False
2. **Which of the following best describes the systems approach to patient safety?**
  - a. Individual providers are primarily to blame for errors that lead to patient harm.
  - b. Underlying systems of care should be studied and changed in order to reduce the occurrence of errors or minimize their impact on patients.
  - c. Patients underlying health conditions are ultimately responsible for patient safety issues.
3. **Assessing the safety culture in a dental clinic can be best achieved by:**
  - a. Conducting triggered chart reviews
  - b. Administering a culture survey to providers and staff
  - c. Using a clinical decision support system
  - d. Becoming a learning health system
4. **Audit and feedback can be best described as:**
  - a. Using computerized decision support to provide actionable information at the point of care
  - b. Providing a summary of a dentist’s quality or safety data in order to encourage change
  - c. A checklist to prevent wrong tooth extractions
  - d. A dentist completing a survey reporting on how they perceive the culture in their clinic
5. **Random chart reviews are more efficient to detect adverse events than the use of triggered chart reviews?**
  - a. True
  - b. False
6. **The structured process to identify potential contributing factors or underlying causes associated with an adverse event is called:**
  - a. Root cause analysis
  - b. Triggered chart reviews
  - c. Clinical decision support
  - d. Audit and feedback
7. **Which of the following is not features of checklists to help avoid patient harm?**
  - a. Aids memory
  - b. Requires a computer to execute
  - c. Provides a step-by-step set of actions to complete
  - d. Confirm that specific actions have been accomplished
8. **The RAPID (Reducing Antibiotic Prescribing in Dentistry) clinical trial provided general dentists with individualized graphical feedback of their antibiotic (ABx) prescribing rate along with a comparison of other dentists prescribing rates. This is an example of:**
  - a. Audit and feedback
  - b. Random chart reviews
  - c. Triggered chart reviews
  - d. Point of care clinical decision support
9. **The use of electronic health records is an essential building block of a Learning Health System.**
  - a. True
  - b. False
10. **A near miss is best defined as**
  - a. A circumstance, action or influence that is thought to have played a part in the origin or development of an incident or to increase the risk of an incident
  - b. The probability that an incident will occur
  - c. An incident that did not reach the patient
  - d. An incident that reached a patient, but no discernable harm resulted

