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## MEETING REPORT

# Learning from data in dentistry: Summary of the third annual OpenWide conference

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## Abstract

The overarching goal of the third scientific oral health symposium was to introduce the concept of a learning health system to the dental community and to identify and discuss cutting-edge research and strategies using data for improving the quality of dental care and patient safety. Conference participants included clinically active dentists, dental researchers, quality improvement experts, informaticians, insurers, EHR vendors/developers, and members of dental professional organizations and dental service organizations. This report summarizes the main outputs of the third annual OpenWide conference held in Houston, Texas, on October 12, 2022, as an affiliated meeting of the American Dental Association (ADA) 2022 annual conference.

## KEYWORDS

dental quality and safety, design thinking, electronic health records, improvement strategies, informatics, learning health system

## 1 | BACKGROUND

In a learning health system, (LHS) “science, informatics, incentives, and culture are aligned for continuous improvement and innovation, with best practices seamlessly embedded in the delivery process and new knowledge captured as an integral by-product of the delivery experience.”<sup>1</sup> Becoming an LHS is challenging as it requires ongoing aggregation and analysis of clinical encounter data, incorporating lessons learned for future improvement, thus creating an active feedback loop.<sup>2</sup> More and more healthcare systems are embracing the culture of continuous learning and improvement with an LHS to create better patient outcomes and quality at a lower cost.<sup>3</sup>

Dentistry lags behind medicine in addressing the notion of an LHS culture, perhaps partly because many dentists still practice in small office settings<sup>4</sup>; and dental electronic health records (EHRs) are

still primarily used for collecting demographic information and billing purposes.<sup>5-7</sup> Hence efforts for using aggregated dental data to examine quality and outcomes for LHS purposes are mostly at investigatory levels.<sup>8,9</sup>

## 2 | MEETING AND PARTICIPANT INFORMATION

This was the third OpenWide Symposium; the first two were held pre-pandemic in 2018 and 2019 as affiliated meetings of the IHI National Forum in Florida, addressing how to advance patient safety in the dental setting and enhance medical and dental integration. The meeting was promoted as in-person, although attendees could attend virtually. Ninety-four people were registered before the event,

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and 64 joined in person, with 20 people joining virtually, including representation from academia, industry, private practice, government, professional societies, and health plans.

### 3 | MEETING STRUCTURE AND OVERVIEW

The executive team of our multidisciplinary research team selected the topics and directed the selection of speakers and logistics of the day. The conference included remarks from national speakers, panel presentations, and breakout groups for participant activities. The presentations, agenda, and participants are available at <https://dentistry.uth.edu/research/centers/tcohqs/openwide>

The in-person meeting was set up to allow participants to cluster in groups of eight. A professional AV permitted service for adding a hybrid version in the form of an IBM platform for streaming the meeting live to viewers. The zoom platform allowed for a virtual breakout group in addition to the in-person breakout groups. Virtual attendees could ask questions directly and via chat, which were relayed by one of the facilitators in real time. The conference was concluded with a social hour to celebrate the opening of the Texas Center for Oral Healthcare Quality and Safety (TCOHQS) at the UTHealth School of Dentistry at Houston, Texas.

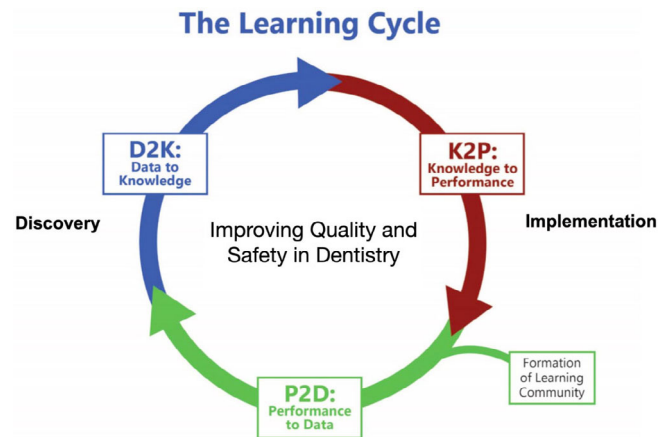
### 4 | MEETING SPEAKERS AND CONTENT

#### 4.1 | Welcome remarks and keynote

Dr. Walji opened the meeting and introduced the goals of the conference: introduce the tenets of LHS to the practicing dental community, promote the culture of safety in dentistry, and discuss topics of importance to new dentists. He explained that the conference agenda is set up in three sessions to explore the three components of the continuous cycle of an LHS: discovery, improvement strategies, and implementation. See Figure 1.

Dr. John Valenza (Dean at the UTHealth Houston School of Dentistry) and Dr. Jiajie Zhang (Dean at the UTHealth Houston School of Biomedical Informatics) opened the conference with brief remarks. They emphasized the role biomedical informatics plays in medicine and dentistry and the importance of building information, knowledge, and then intelligence/wisdom. They posed the question of how AI/informatics technology can improve the quality of care for our dental patients and how using the EHR can help improve the patient-dentist relationship.

Dr. Charles (Chuck) Friedman gave the keynote address by taking the audience through the various definitions of an LHS and exploring what makes using an LHS approach to health improvement different from other approaches.<sup>10</sup> An LHS can exist at any level of scale, that is, as a single organization, a network, or at a national, state, or regional level, when it continuously and routinely improves health by marrying discovery to implementation.<sup>11</sup> Dr. Friedman proposed a checklist to make this marriage happen:



Adapted from <https://medicine.umich.edu/dept/lhs/explore-learning-health-sciences/our-approach>

**FIGURE 1** The three components of the continuous cycle of an LHS.

- Routine capture of data, events, and context
- Rapid translation of these data to actionable knowledge
- Continuous improvement
- Infrastructure (people, policies, technology, etc.) that supports sustainability and economies of scale
- Ensuring all of the above become an integral part of the organizational culture.

He stressed that every LHS needs to be comfortable embracing uncertainty and continuous learning, that is, the community that discovers is the community that implements (no hand offs) potentially requiring a culture shift. The infrastructure needs to be adapted to become interconnected and shared. He provided several examples, including the Swiss Learning Health System.

#### 4.2 | Session 1: Discovery

In this first session, the four speakers explored and discussed best practices in measuring quality and safety, and the technology infrastructure needed.

Dr. Tokede reported on how we can use data to improve care. He imaginatively showed how data is the currency of our century and stressed that the dental EHR allows for passive collection of lots of data points.<sup>12</sup> Hence this allows for real-time processing of data, for example, with the use of dashboards, and learning from data retrospectively, for example, using dental quality measures.<sup>13-16</sup>

Dr. Suda described the various data sources and datasets available for medication prescribing.<sup>17</sup> She highlighted how medication data can be used to identify opportunities for improvement, inform future work, and determine the effectiveness of interventions. She illustrated her presentation with examples of barriers and facilitators to antibiotic prescribing in the VA dental settings.<sup>18</sup>

Dr. Geierman shared his thoughts on the importance of transparency for patient safety. He noted that transparency is difficult for

dentists as the culture tends to be quiet about patient safety incident. Specifically, 90% of dentists do not have the tools or the resources to talk to their patients if something bad happens. Additionally, even though hospitals have to report patient safety incidents, there is no requirement for dental offices to do so. The American Dental Association (ADA) recommends reporting of anonymous, non-identifiable near misses and adverse events (AEs); however, reporting to the Dental Patient Safety Foundation (DPSF) is perceived as cumbersome. Moreover, dentists fear legal consequences and liability if they report an AE.

Dr. Balaban discussed using AI and machine learning (ML) in dentistry. He explained how algorithms can be trained to detect caries progression, secondary caries, calculus, and bone loss. He underscored the positives of AI, including accuracy, ability to continuously learn, interoperability, unlimited capacity, and inability to forget. He explained that 3D radiographs (eg, CBCT) are the best for building an AI model, because there will always be some issues around distortions and superposition with 2D-x-rays (eg, bitewing). Ongoing efforts are being made to overcome this challenge. He suggested that AI is a powerful clinical decision tool that will facilitate the marrying of the discovery phase with the implementation phase of the LHS cycle.

An interactive panel session with the four speakers and the audience completed the first session. The discussion centered on interoperability and how systems could better talk with each other; whether or when AI would replace chart review as the gold standard; and how to put passion back into our work.

### 4.3 | Session 2: Improvement strategies

In the second session, the three speakers explored and discussed how to use design thinking to turn knowledge into strategies for improving dental quality and safety.

Ms. Yeager shared how following a service design process employing human-centered design methods and tools can accelerate innovation to solve critical care issues. She explained that design has multiple manifestations: (i) it is focused on improving the human experience; (ii) it is a process that follows an iterative framework that first solves the right problem and then solves the problem right; (iii) it is a mindset that is focused on the future and thus allows for creativity and innovation; but also accepts ambiguity, embraces risk, is empathetic, and collaborative. She shared her experience using a human-centered design approach to improve quality and safety in pediatric dental sedation.

Dr. Ojha provided information on designing and developing the ADA Dental Experience and Research Exchange (DERE). She explained that the use of claims data for quality improvement is insufficient and that real-world data outside of randomized controlled trials (RCTs) are essential. She noted that agile data hubs combine the quality of a traditional registry with the quantity of a data lake. The ADA aims to set up a clinical data warehouse with data for all dental practices accessible to researchers and stakeholders. Their near-term goal is to collect 5 million data over 5 years (2021–2026).

Dr. Tranby discussed the principles of program design and evaluation, specifically the use of driver diagrams, the model of improvement, and its PDSA cycle. He stressed that customized solutions are the way to create sustained excellent results.

Session 2 was completed with a group exercise on design thinking as described under Section 5.

### 4.4 | Session 3: Implementation approaches

The third session explored how to implement and evaluate improvement strategies in dental practice.

Dr. Rindal shared his experience in implementing clinical decision support (CDS) systems in a large integrated health system. He explained the importance of CDS for improving care. He provided examples of the Tobacco CDS and DIODE (De-Implementing Opioids after Dental Extraction) CDS and conveyed that the current uptake of CDS is low among dental providers. He suggested that alignment with the organization's priorities is essential and that incentives make a difference for the successful uptake of any CDS.

Ms. Mullins and Mr. Brandon shared their experience in implementing quality measures in a large dental group practice. Their passion for improving patient oral health was the driver behind this initiative. Their practice has been able to reach outstanding results utilizing good data and CDS. They used CDS as an effective way to guide clinicians to implement preventive dental interventions, and as such were able to effectively increase the application of dental sealants in children. The key to success, they argued, is good data, volume, and high-quality CDS.

Dr. Gilbert shared lessons learned from the National Dental Practice-Based Research Network (Network) by implementing interventions in small practice settings. He suggested that even with significant medicolegal pressure, it cannot be presumed that standards of care are being followed, likely because practitioners' beliefs and attitudes drive care decisions, for example, less than half of dentists use a rubber dam all the time during root canal treatment. Dr. Gilbert opined that PBRNs can be very productive and impactful. He also anticipates that network participation will foster improvement in practice based on real-world clinical data.

Dr. Wright shared the various ways to disseminate findings in dentistry. He reviewed the importance of RCTs, systemic reviews, and evidence-based clinical practice and how to balance standardized treatment/clinical guidelines and patient factors (ie, satisfaction, SES, preferences, etc.). He noted that evidence-based guidelines should be based on systemic reviews,<sup>19</sup> and that big data must play a role in developing guidelines. To date, big data sources for JADA publications include data from the Centers for Medicare and Medicaid Services (CMS), EHRs, National Health and Nutrition Examination Survey (NHANES), National Longitudinal Study of Adolescent to Adult Health (Add Health), and the National Dental Practice-Based Research Network.

## 5 | WORKGROUP SESSION

As part of Session 2, participants were asked to engage in a design exercise. A short background was offered on developing a dry socket as a specific dental diagnosis that includes pain as a dental adverse event and a brief clinical vignette was provided (see Box 1). The vignette was transcribed into the patient's surgical journey to visualize the scenario better (see Figure 2). Five breakout groups were created,

### Scenario

A 57-year-old female patient presented to the dentist for uncomplicated extractions of 5 (pre)molars. The teeth came out uneventfully.

The patient received standard post op instructions including use of OTC meds; she was not instructed to stop smoking. Two days later the patient returns as an unscheduled urgent appointment complaining of severe pain over the area of the extracted molar in the lower left site.

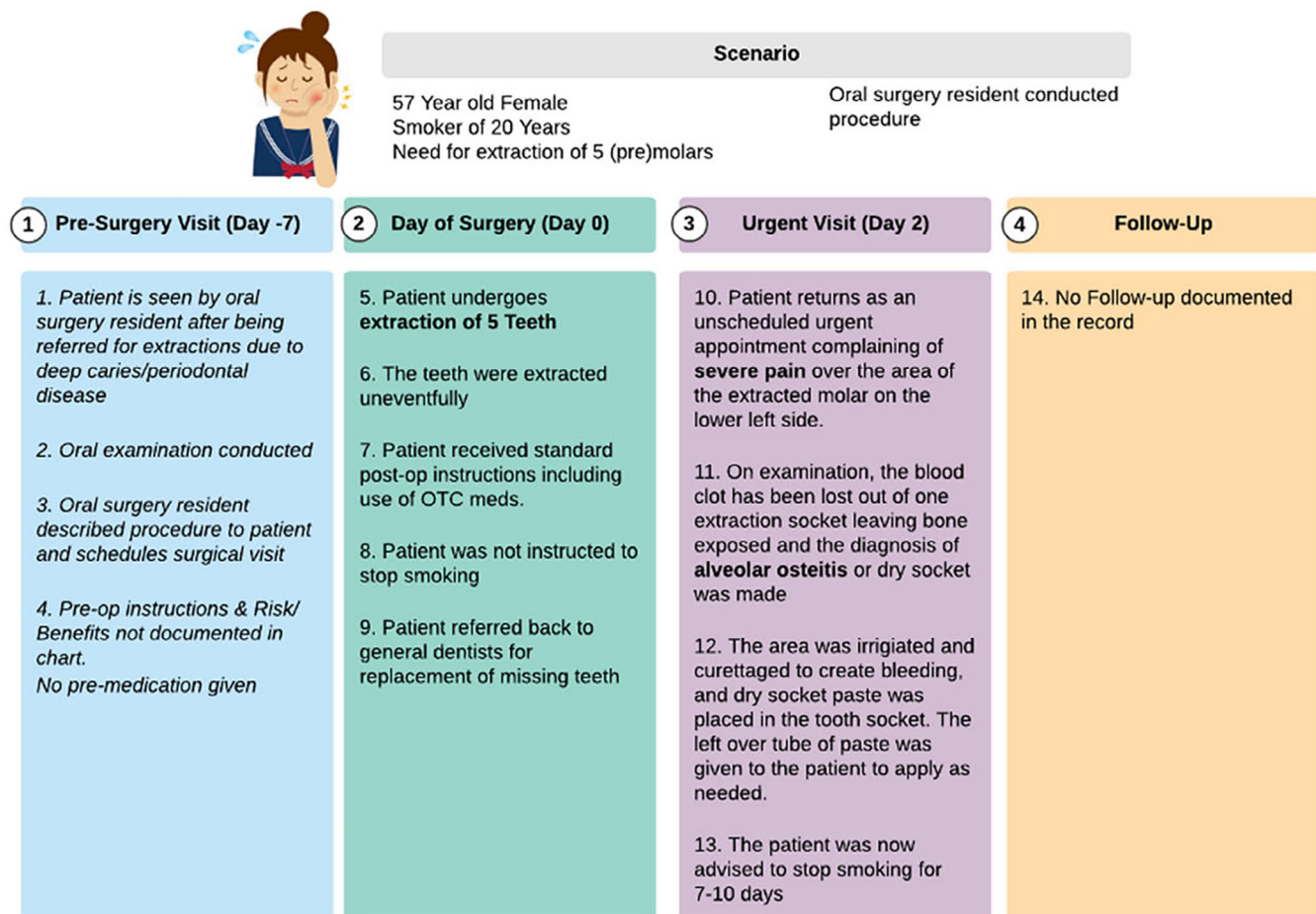
On examination, the blood clot had been lost out of one extraction socket leaving bone exposed and the diagnosis of dry socket (alveolar osteitis (AO)) was made. The area was irrigated and curettaged to create bleeding, and dry socket paste was placed in the tooth socket. The left-over tube of paste was given to the patient to apply as needed. The patient was now advised to stop smoking for 7-10 days.

**BOX 1** Clinical vignette used for design thinking exercise.

including one virtual breakout group for the participants attending the meeting online. Each group was asked to redesign a portion of a patient's surgical journey (pre-surgery, surgery, urgent care appointment, post-surgery) to improve the patient's case management experience. Each group was facilitated by one of the conference organizers. The groups spent 45 min in designing improvement approaches and then reported out. Participants appreciated the value of collaboration and being able to practice the various components of design thinking.

## 6 | CLOSING AND REFLECTIONS

The conference concluded with reflections from Drs. Cooley, Geierman, Casamassimo, and Kalenderian, who pointed out that medicine has taken the lead in embracing the concept of LHS and patient safety compared with dentistry. They reiterated that dentistry still lacks a systematic approach to quality improvement and patient safety. Although many dental healthcare organizations aspire to become learning health systems, only a few have successfully embraced the fundamental principles of an LHS. The urgency for an LHS in dentistry is heightened due to the significant variation in the quality of care provided to patients.



**FIGURE 2** Scenario of clinical vignette.

In the past, these challenges were exacerbated by the fact that dentists primarily practiced as solo practitioners. However, the landscape has evolved, with half of dentists now practicing in larger group practices, some integrated into healthcare delivery systems. This shift increases the feasibility of implementing an LHS in dental practice.

The conference discussion highlighted several opportunities, next steps, and potential future conference topics. For instance, there is an immediate need to establish the foundational informatics infrastructure, including the aggregation of high-quality, complete, and representative data on patient experiences throughout the healthcare delivery system. It may even be necessary to mandate the routine collection of key data, such as dental diagnoses, required to assess the quality and safety of care.

Dentistry must also undergo a cultural shift and demonstrate a firm commitment to systematically measuring the quality and safety of care. Engaging all levels of the dental care system, including the public, is crucial. While dental care remains predominantly fee-for-service, other models, such as value-based care, which incentivize quality, are likely necessary to drive meaningful progress.

Lastly, dental education and accrediting bodies have a significant role to play in educating students on quality assessment and fostering a critical evaluation of the care they provide to patients as part of an LHS. The speakers and participants agreed that change is coming and that the future is bright for dentistry and our patients.

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## CONFLICT OF INTEREST STATEMENT

The authors have no competing interests to declare, financial or otherwise.

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