

Advancing Dental Patient Safety: A Critical Appraisal of Current Realities and Future Directions

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Abstract Oral health serves as a pivotal component of overall well-being, functioning as a gateway to the broader realm of bodily health. Yet, the field of dentistry, often marginalized within the healthcare landscape, grapples with significant challenges. On one hand, it caters to the demands of affluent individuals seeking expensive cosmetic treatments, while on the other, millions of underprivileged individuals in developing nations lack access to even basic dental care. The prevailing, costly, and unsustainable approach in dentistry, often described as "drill and fill (and bill)," calls for a fundamental shift towards a more affordable and evidence-based focus on prevention. The ultimate goal is to empower individuals to preserve their natural teeth and oral health throughout their entire lives. Patient safety, a concept inherently intertwined with healthcare, has recently evolved into a distinct and multidimensional field encompassing economic, social, cultural, and organizational dimensions. In the realm of dentistry, patient safety remains a developing area, characterized by limited comprehension of effective tools and interventions to enhance safety and mitigate adverse events. The global COVID-19 pandemic has exerted profound effects on dental education, presenting formidable challenges to scholars and educators across various clinical and non-clinical training domains. These challenges extend to adapting to accessible and informative online educational content, as well as addressing partial hands-on dental experiences. This review underscores the pressing need for dental institutions to adapt proactively to the evolving landscape of dental education, ensuring they

can effectively meet the demands and uncertainties of the future.

Keywords Oral Health, Dental Education, Patient Safety, Health Professionals

1. Introduction

The healthcare industry is widely acknowledged as a high-risk environment, characterized by the potential for errors, adverse events, and consequential morbidity and mortality [1]. However, the adoption of preventive measures in healthcare has been comparatively sluggish when juxtaposed with other high-risk industries [2-3]. Patient safety, as an independent field of knowledge, has only recently gained recognition and prioritization. A pivotal milestone in delineating patient safety as a distinct area of study was marked by the Institute of Medicine's seminal study, "To Err is Human: Building a Safer Health System," published in the early 2000s [4]. This study revealed that the number of preventable medical errors in the United States ranged from 44,000 to 98,000 cases annually, leading to a significant impact on individuals' health [5-6]. The revelation of these statistics prompted heightened public awareness and compelled healthcare professionals, managers, and policymakers to prioritize patient safety as a critical concern.

The imperative to enhance patient safety has spurred

extensive efforts to cultivate a safe healthcare climate. Virtually all healthcare organizations are actively involved in training and executing events aimed at improving patient safety. The World Health Organization (WHO) has launched the World Alliance for Patient Safety to instill a culture of patient safety globally. Furthermore, the Council of European Dentists (CED) has issued a safety resolution recognizing the roles of international bodies such as WHO, the Organization for Economic Co-operation and Development (OECD), and the Council of Europe in identifying patient risks and formulating references to prevent adverse situations. In the domain of dentistry, professionals and researchers are increasingly acknowledging the significance of patient safety and actively seeking ways to enhance safety practices within the field [7-8]. Despite considerable attention and efforts devoted to patient safety across various healthcare sectors, including dentistry, there is still progressed to be made globally. Continuous research and collaborative initiatives are imperative for advancing patient safety in dentistry and ensuring the well-being of patients [8-10].

The term "patient safety" has been defined by the WHO in 2011 as involving the minimization of preventable harm related to healthcare to an acceptable level. In 2009, the WHO developed a taxonomy providing a comprehensive framework for understanding patient safety in both primary and secondary care research. (&) This taxonomy encompasses key terms such as "adverse events," referring to unintended incidents during healthcare that may cause harm to patients. Preventable adverse events are those that could have been avoided with standard care practices. "Near misses" describe situations where medical errors almost led to harm but were averted due to chance or timely intervention.

In primary medical care, approximately 50 patient safety instances occur in 100,000 encounters, with around 11% of prescriptions containing errors. A systematic review focusing on interventions in primary care revealed a lack of patient involvement, primarily emphasizing the prevention of adverse drug reactions. A study examining electronic records from 20 dental practices in the Netherlands identified 18 adverse events among 13,615 patient contacts, including errors such as incorrect extractions, retained roots, complications in endodontic procedures, and swallowed dental crowns [11].

Within the realm of dentistry, it is crucial to underscore the existence of several conspicuous research gaps and pressing priorities that warrant diligent examination to strengthen patient care and address evolving challenges in the field. These prominent research avenues encompass a diverse spectrum, notably revolving around biomaterials and advancements in dental technologies, strategies for the prevention and effective management of oral diseases, the intricacies of oral health in specialized populations, the pivotal fusion of oral health considerations with holistic health, the disconcerting issue of health disparities and equitable access to care, and the indispensable

development of evidence-based practices and clinical guidelines. The primary objective of this study on patient safety in dentistry is to focus on current trends, challenges, and opportunities for improvement. This includes identifying current trends within the field, assessing the multifaceted challenges that practitioners face, and exploring viable opportunities for improvement. By addressing these key aims, our research endeavors to enhance the quality of patient care in dentistry, ensuring the utmost safety and well-being of dental patients.

2. Methodology

The literature search was meticulously conducted employing a systematic methodology, emphasizing key terms such as "Oral Health," "Dental Education," "Patient Safety," and "Health Profession." A comprehensive set of inclusion criteria was established to ensure the meticulous selection of pertinent articles, including research articles and clinical guidelines, specifically addressing patient safety in dentistry within the last 5 years. The chosen studies were required to delve into topics encompassing trends, challenges, and opportunities in the realms of oral health, dental education, and health professions.

To ensure a broad and inclusive perspective, studies from diverse geographic regions were considered in the review. Conversely, exclusion criteria were rigorously applied to maintain the integrity and relevance of the review. Articles published in languages other than the English language were excluded, as were studies not directly associated with patient safety in the dental context. Additionally, non-empirical content such as opinion pieces, editorials, and letters to the editor were systematically excluded. To execute this thorough literature search, multiple scientific databases were judiciously utilized such as PubMed, Google Scholar and Web of Science. This meticulous approach to the search strategy aimed to capture a robust and up-to-date representation of the existing literature on patient safety in dentistry, ensuring the synthesis of a well-rounded and evidence-based review.

3. Result and Discussion

Patient safety is not a new area to be studied for avoiding preventable adverse events and minimizing the effect of certain events in healthcare, including dentistry. It encompasses various factors and can be well-defined by providing better healthcare opportunities by protecting patients from any type of harm. Patient safety involves analyzing health systems and identifying latent risks that contribute to adverse events [12]. These risks can range from physical hazards to organizational and communication issues. Adverse events often occur in a context that enables them. Patient safety is non-punitive

and emphasizes the reporting of adverse events anonymously to focus on prevention rather than punishment. Through thematic evaluation, this study delved into various aspects of patient safety within the field of dentistry.

1. Patient Safety in Dentistry: A Comprehensive Approach:

Patient safety within the field of dentistry represents a longstanding commitment to ensuring the well-being of individuals undergoing oral healthcare. This comprehensive approach encompasses a proactive stance aimed at preventing and mitigating preventable adverse events, thus fostering an environment of care that prioritizes the safety and satisfaction of patients. In the intricate landscape of dental practice, the multifaceted measures undertaken underscore the fundamental role patient safety plays in the dental profession. Patient safety involves a proactive stance towards enhancing healthcare delivery by shielding patients from potential harm. In dentistry, the commitment to patient safety encompasses a multifaceted set of measures, including stringent infection control protocols, meticulous attention to medication safety, vigilant management of radiation exposure, adherence to equipment safety standards, preparedness for emergent situations, effective patient communication strategies, proactive error prevention methodologies, and continuous professional development through rigorous continuing education [13]. The non-punitive nature of patient safety emphasizes the importance of anonymously reporting adverse events, underscoring a focus on prevention over punishment.

In the realm of dentistry, ensuring patient safety stands as a cornerstone of ethical and professional responsibility. This commitment involves a comprehensive approach, starting with stringent infection control protocols that prioritize cleanliness and sterilization, safeguarding both patients and practitioners from potential infections. Medication safety takes centre stage, emphasizing accurate dosage administration and vigilant monitoring for potential adverse drug events. Moreover, the meticulous management of radiation exposure during diagnostic procedures adheres to strict safety standards, minimizing unnecessary radiation and ensuring patient well-being. Preparedness for emergent situations is paramount, with the development of effective emergency response plans that empower dental practitioners to swiftly address unforeseen challenges. Transparent and effective patient communication strategies are integral, and fostering trust and ensuring patients are informed about their oral health and treatment plans. Proactive error prevention methodologies, coupled with continuous education and training, serve as pillars for staying abreast of evolving safety protocols. The commitment extends to continuous professional development, where rigorous continuing education programs contribute to the ongoing competence of dental professionals. Collectively, this comprehensive

approach to patient safety in dentistry reflects a dedication to providing high-quality oral healthcare while creating a secure and trustworthy environment for patients.

2. Integration of Technology and Digital Health in Patient Safety:

In the contemporary landscape of healthcare, the integration of technology and digital health plays a pivotal role in advancing patient safety. The burgeoning digitization of healthcare, including dentistry, has ushered in transformative approaches to enhance the quality of care and ensure the well-being of patients. Cutting-edge encryption and blockchain technologies have emerged as crucial elements in fortifying the protection of patient health data, ensuring data privacy, and enhancing overall security [14].

In dental practices, where the safeguarding of sensitive patient information is paramount, AI-driven solutions are employed to implement robust data security measures. Advanced encryption algorithms and secure data storage protocols ensure that patient records remain confidential and protected from unauthorized access. The decentralized nature of some AI systems, such as those utilizing blockchain technology, adds an additional layer of security by reducing the risk of centralized vulnerabilities [15].

In recent times, the adoption of blockchain technology has witnessed a notable surge across various sectors, healthcare included [16,17,18]. This trend is unsurprising, given the inherent qualities of blockchain as an immutable, transparent, and decentralized distributed database [19], offering the potential to establish a reliable and secure value chain. The ongoing digitization of the healthcare industry has prompted the development of medical information systems, recognizing the critical role of healthcare data in diagnosing illnesses and informing future interventions. Contrastingly, historical methods involved recording information on easily alterable and destructible media [20,21]. The imperative for contemporary systems lies in their ability to securely and efficiently communicate data [22]. Additionally, these systems must facilitate enhanced levels of anonymity, privacy, and access control for each user.

Artificial intelligence (AI) is making significant inroads into enhancing patient safety in healthcare, including dentistry. The integration of AI-driven solutions in dental practices is revolutionizing various aspects of patient care, safety, and overall efficiency [23]. Artificial intelligence-driven cybersecurity solutions also play a pivotal role in real-time threat identification and mitigation, reinforcing the overall security posture. As telemedicine expands, secure communication platforms and robust telehealth infrastructure become imperative to safeguard patient information during remote healthcare interactions. Global collaborative initiatives and frameworks address the complex challenges associated with cross-border data security, promoting best practices to secure patient information in the interconnected healthcare landscape.

3. Challenges and Opportunities in Patient Safety Research and Practice:

Research in patient safety within dental practices has focused on understanding errors through the analysis of electronic health records (EHR) and retrospective case reviews. The paper identifies pressing challenges such as a lack of comprehensive reporting and analysis, the need for a robust patient safety culture, challenges in communication and coordination among healthcare professionals, and the dispersed nature of dental care. Opportunities for improvement include promoting a pervasive patient safety culture, standardizing protocols and guidelines, reinforcing inter-professional collaboration, and strategic investments in training and essential resources for healthcare professionals. Governmental policies and programs, exemplified by the National Rural Health Mission (NRHM), the National Oral Health Program (NOHP), and others, contribute significantly to advancing patient safety within dental practices. Continuing education and professional development in dentistry, specifically through Continuing Dental Education (CDE), are deemed essential for ensuring dental professionals remain informed and deliver evidence-based, high-quality care to the community [24].

4. Blockchain Technology and Healthcare Privacy:

Blockchain technology is proving to be a revolutionary force in safeguarding healthcare privacy. Unlike traditional centralized systems, blockchain operates on a decentralized and distributed ledger, offering unprecedented security and transparency. The healthcare sector grapples with persistent challenges such as data breaches and interoperability issues, and blockchain provides a robust solution by ensuring the immutability of patient records [25].

The burgeoning digitization of healthcare and the reliance on electronic health records (EHR) have raised concerns about patient data security. Unauthorized access to such data poses risks to patient well-being and may lead to legal repercussions for healthcare professionals. Patient safety, within the context of digital health, extends beyond physical care to encompass the protection of sensitive health information [26]. Blockchain technology emerges as a promising solution, serving as a decentralized and distributed ledger that disperses data among multiple network nodes, reducing the likelihood of centralized vulnerabilities. The integration of smart contracts automates data sharing and enforces privacy laws. Despite the potential benefits, challenges such as interoperability and practical implementation complexities need attention. Blockchain technology amalgamates privacy-enhancing technologies to fortify the security of sensitive patient data, addressing the dual imperative of safeguarding personal information while facilitating authorized access.

5. Transformations in Dental Care Amidst the COVID-19 Pandemic:

The landscape of dental care has undergone significant transformations in response to the COVID-19 pandemic, necessitating a reevaluation of established protocols to ensure the safety of both patients and dental professionals. Embracing innovation and leveraging technology, the dental industry has adapted to ensure the continuity of care while prioritizing patient safety. Tele-dentistry has emerged as a pivotal aspect, offering virtual consultations that not only minimize the risk of virus transmission but also enhance accessibility to dental services [27]. Stringent infection control protocols, enhanced sterilization and disinfection procedures, and elevated use of Personal Protective Equipment (PPE) have become imperative to maintain optimal hygiene standards and minimize the potential for viral exposure during patient interactions. Changes in patient flow management, appointment scheduling, and waiting area configurations align with social distancing guidelines. Integration of telehealth services provides remote assessments and minimizes in-person contact. Radiation safety protocols, digital technologies like tele dentistry and electronic health records, and emergency response plans have been refined to address the challenges posed by the pandemic [28]. Patient communication strategies and proactive error prevention methodologies, coupled with continuous education and training, underscore the resilience and adaptability of the dental profession in prioritizing patient safety.

6. Educational Adaptations for Future Dental Professionals:

The reverberations of the COVID-19 pandemic extend to the education of future dental professionals in academic institutions. A paradigm shift in teaching approaches includes virtual learning platforms, tele education, and the integration of technology to ensure continuity in education. The curriculum has been revised to incorporate an emphasis on infection control, patient safety, and the application of safety protocols in clinical practice. Clinical training has evolved to prepare students for the implementation of safety measures, utilizing simulated patient encounters and case-based learning. Interdisciplinary education initiatives, incorporating telehealth and tele dentistry, enable students to explore innovative ways of delivering oral healthcare while considering safety measures. The focus on fostering a resilient and adaptable mindset prepares students for unforeseen challenges in their future careers, contributing to the overall well-versed and safety-conscious dental professionals of the future [29].

4. Conclusions

Emerging paradigms are actively shaping the trajectory of dental care through the assimilation of technological advancements and the deployment of innovative

methodologies. The integration of Artificial Intelligence and Machine Learning (AIML) systems stands out as a transformative trend, facilitating the diagnosis of oral diseases, the analysis of radiographic imagery, and the prediction of treatment outcomes. This integration not only heightens the precision and efficiency of dental care but also mitigates the potential for errors. Simultaneously, the adoption of tele-dentistry represents a burgeoning trend, enabling remote consultations, virtual assessments, and continuous monitoring of patients' conditions. These modalities are instrumental in ameliorating access to care, particularly for marginalized populations, and enable timely interventions and early identification of potential complications. Furthermore, an escalating emphasis is being placed on data analytics and digital tracking systems to discern patterns, trends, and risk factors associated with patient safety incidents. Through harnessing the power of big data and predictive analytics, dental practices can proactively address latent safety concerns and enact precisely targeted interventions.

Moreover, the Government of India has delineated a set of guidelines pertinent to the dental profession and the welfare of patients. These encompass regulations pertaining to the governance of professional education, the oversight of dental clinical establishments, and the meticulous regulation of dental equipment, instruments, and materials. These guidelines collectively contribute to the framework that ensures the highest standards of care, education, and safety within the dental field in India.

Authors' Contribution

Conception or design of the work- Anambir Singh; Writing & analysis- Mohd Shannawaz; Karuna Nidhi; drafting the work- Archana Koul, Editing the draft -Mandeep Kour.

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REFERENCES

[1] Colla, J. B., Bracken, A. C., Kinney, L. M., & Weeks, W. B.

(2005). Measuring patient safety climate: a review of surveys. *BMJ Quality & Safety*, 14(5), 364-366.

- [2] Allard, J., Bleakley, A., Hobbs, A., & Coombes, L. (2011). Pre-surgery briefings and safety climate in the operating theatre. *BMJ quality & safety*, 20(8), 711-717.
- [3] Sammer, C. E., Lykens, K., Singh, K. P., Mains, D. A., & Lackan, N. A. (2010). What is patient safety culture? A review of the literature. *Journal of nursing scholarship*, 42(2), 156-165.
- [4] Donaldson, M. S., Corrigan, J. M., & Kohn, L. T. (Eds.). (2000). *To err is human: building a safer health system*.
- [5] Singer, S. J., Gaba, D. M., Falwell, A., Lin, S., Hayes, J., & Baker, L. (2009). Patient safety climate in 92 US hospitals: differences by work area and discipline. *Medical care*, 23-31.
- [6] Nicklin, W., Mass, H., Affonso, D. D., O'Connor, P., Ferguson-Paré M., Jeffs, L., ... & White, P. (2004). Patient safety culture and leadership within Canada's Academic Health Science Centres: towards the development of a collaborative position paper. *Nursing Leadership (Toronto, Ont.)*, 17(1), 22-34.
- [7] Lee, W. C., Wung, H. Y., Liao, H. H., Lo, C. M., Chang, F. L., Wang, P. C., ... & Hou, S. M. (2010). Hospital safety culture in Taiwan: a nationwide survey using Chinese version Safety Attitude Questionnaire. *BMC health services research*, 10(1), 1-8.
- [8] Hellings, J., Schrooten, W., Klazinga, N. S., & Vleugels, A. (2010). Improving patient safety culture. *International journal of health care quality assurance*, 23(5), 489-506.
- [9] Zwart, D. L., Langelaan, M., van de Vooren, R. C., Kuyvenhoven, M. M., Kalkman, C. J., Verheij, T. J., & Wagner, C. (2011). Patient safety culture measurement in general practice. *Clinimetric properties of SCOPE*. *BMC family practice*, 12, 1-7.
- [10] Huang, D. T., Clermont, G., Sexton, B. J., Karlo, C. A., Miller, R. G., Weissfeld, L. A., ... & Angus, D. C. (2007). Perceptions of safety culture vary across the intensive care units of a single institution. *Critical care medicine*, 35(1), 165-176.
- [11] Berwick, D. (2013). *A promise to learn—a commitment to act: improving the safety of patients in England*. London: Department of Health, 6.
- [12] Vincent, C. (2011). *Patient safety*. John Wiley & Sons.
- [13] Emanuel, L., Berwick, D., Conway, J., Combes, J., Hatlie, M., Leape, L., ... & Walton, M. (2009). What exactly is patient safety?. *Journal of Medical Regulation*, 95(1), 13-24.
- [14] House of Commons Health Committee. (2009). *Patient safety. Sixth report of session 2008–09*. London: The House of Commons.
- [15] Safety, W. P., & World Health Organization. (2011). *Patient safety curriculum guide: multi-professional edition*.
- [16] Bailey, E., Tickle, M., & Campbell, S. (2014). Patient safety in primary care dentistry: where are we now?. *British dental journal*, 217(7), 339-344.

- [17] World Health Organization. (2012). Patient safety research: a guide for developing training programmes.
- [18] Safety, W. P., & World Health Organization. (2010). Conceptual framework for the international classification for patient safety version 1.1: final technical report January 2009 (No. WHO/IER/PSP/2010.2). World Health Organization.
- [19] Dekker, S. W. (2001). The re-invention of human error. *Human factors and aerospace safety*, 1(3), 247-265.
- [20] Obadan, E. M., Ramoni, R. B., & Kalenderian, E. (2015). Lessons learned from dental patient safety case reports. *The Journal of the American Dental Association*, 146(5), 318-326.
- [21] Kalenderian, E., Obadan-Udoh, E., Maramaldi, P., Etolue, J., Yansane, A., Stewart, D., ... & Walji, M. F. (2021). Classifying adverse events in the dental office. *Journal of patient safety*, 17(6), e540-e556.
- [22] Stoumpos, A. I., Kitsios, F., & Talias, M. A. (2023). Digital Transformation in Healthcare: Technology Acceptance and Its Applications. *International journal of environmental research and public health*, 20(4), 3407. <https://doi.org/10.3390/ijerph20043407>
- [23] Perea Pérez, B., Santiago Sáez, A., García Marín, F., Labajo González, E., & Villa Vigil, M. A. (2011). Patient safety in dentistry: dental care risk management plan.
- [24] Yamalik, N. (2007). Quality systems in dentistry Part 1. The increasing pressure for quality and implementation of quality assurance and improvement (QA/I) models in health care. *International dental journal*, 57(5), 338-346.
- [25] Yamalik, N. (2007). Quality systems in dentistry part 2. Quality assurance and improvement (QA/I) tools that have implications for dentistry. *International dental journal*, 57(6), 459-467.
- [26] Boschung, P. M. (2001). Quality in dental practice—from the standpoint of health policy. *Quality in Dental Practice—Symposium—Plenary session of the European Regional Organization of the Federation Dentaire Internationale (ERO-FDI) 4–5 May 2001, Berne, Switzerland*. Reprint from. *Schweiz Monatschr Zahnmed*, 111, 47-50.
- [27] Kolahi, A. A., Sohrabi, M. R., Abdollahi, M., & Soori, H. (2010). Setting research priority in Shahid Beheshti University of Medical Sciences: methods, challenges, limitations. *Pajoohandeh Journal*, 15(4), 143-151.
- [28] Bailey, E., Tickle, M., Campbell, S., & O'Malley, L. (2015). Systematic review of patient safety interventions in dentistry. *BMC Oral Health*, 15, 1-11.
- [29] World Health Organization. (2009). Conceptual framework for the international classification for patient safety. Geneva: World Health Organization.