FDI World Dental Federation

Project

Integrated Electronic Health Records

CONSENSUS STATEMENT

A strategic framework for unifying electronic dental and medical records

fdiworlddental.org

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EXECUTIVE SUMMARY

The successful integration and utilization of electronic health records (EHRs) presents a unique opportunity to enhance patient care by unifying dental and medical digital health information into a single system. Realizing this potential depends on accurately identifying and addressing users' needs across different environments. To emphasize the strong connection between oral health and overall well-being—and to highlight the importance of seamless data sharing in enabling systemic healthcare approaches—FDI World Dental Federation launched a project focused on embedding oral health within broader digital health records.

This Consensus Statement underscores the importance of integrated EHRs and outlines a strategic framework for their implementation. Specifically, it:

- Highlights the role of integrated EHRs in supporting holistic patient care, improving communication among healthcare providers, enhancing medication management, streamlining referrals, and reducing healthcare costs. Holistic patient care ensures that healthcare providers address a person's physical, mental, emotional, and social well-being, rather than treating conditions in isolation. It measures success through patient reported outcomes.
- Identifies eight key oral health indicators that should be incorporated into a unified health record system to enhance clinical decision-making and patient outcomes.
- Examines the challenges to full integration, including standardization, stakeholder engagement, data security and privacy, cost barriers, and international coordination.
- Provides policy recommendations for integrating oral health into electronic records, aligning with global policy developments and regulatory frameworks.
- Emphasizes the need for investment, advocacy, and strategic implementation, with potential funding sources ranging from government incentives to public-private partnerships.

Ultimately, this Consensus Statement calls for urgent action to integrate oral health into global healthcare systems, ensuring seamless data exchange, improved patient outcomes, and a stronger, more coordinated healthcare infrastructure.

INTRODUCTION

Project scope and methodology

Objectives

The integration of health records offers a range of potential benefits, opportunities, and challenges, necessitating careful consideration of core health indicators and implementation strategies. This Consensus Statement incorporates expert insights on these themes and more, with the aim of advancing the use of integrated electronic health records (EHRs) and improving patient care. Specifically, the project was tasked with meeting the following objectives:

1. Examine the importance and anticipated benefits of the integration of electronic health records.
2. Determine the current state of utilization of digital oral health electronic records globally.
3. Determine the current level of integration between oral health and other health information systems.
4. Determine the current challenges to integration and data sharing between health information systems.
5. Determine a core set of oral health indicators that should be integrated with other health records to optimize overall health outcomes, improve the quality of healthcare, and enhance patients' quality of life.
6. Determine the essential core health data that should be shared with the oral health record to optimize health outcomes, quality of oral healthcare, and patient quality of life.

Methodology

The methodology used to achieve these objectives is summarized below.

Engage with end-users, such as dental and healthcare professionals, to gather insights on the integration and usage of digital health records, focusing on the incorporation of oral health records.

Conduct a scoping review to understand the integration of digital health records in dentistry and the global landscape of healthcare records, highlighting the importance of oral health indicators.

Hold an International Advisory Meeting with health experts to offer guidance and develop strategies for better integration of electronic dental and medical health records.

Produce a Consensus Statement on the need for improved integration of electronic dental and health records, based on expert insights, to advance integrated EHRs and patient care in oral health.

Overview of digital health records

Healthcare in many regions of the world has increasingly adopted digital health records. These records store patient medical and dental information in electronic data systems, largely replacing traditional paper-based records and transforming how patient information is managed and accessed.

The capture of individual health data in digital format significantly improves the availability of patient information for both patients and healthcare systems. It enables the secure retrieval of critical health data anytime and anywhere, provided that systems support secure information sharing. Digital records are more easily searchable, retrievable, and storable, with backup options that reduce the risk of loss or damage. They provide real-time access to up-to-date patient information, facilitating timely and informed decision-making. This is especially beneficial in emergencies, during patient evaluations and diagnoses, when planning treatment, and even during patient consultations to ensure accuracy and continuity of care.

Types of digital health records

Several terms are commonly used to describe digital health records, often interchangeably, which can create confusion regarding their specific meanings and applications. For the purposes of this Consensus Statement, we define and differentiate the key types of digital health records to establish clarity and consistency in their use, initially focusing on the record types designed primarily for access by healthcare providers.

Electronic Medical Records (EMRs)

EMRs are used within a single healthcare practice, facility, or specialty, with a narrow breadth and scope of data focused on capturing medical and treatment histories specific to that setting. They are primarily designed for internal use, with limited interoperability, making them unsuited for broader care coordination. EMRs are tailored to the localized needs of individual providers and are supported by a wide variety of software systems[1].

Electronic Dental Records (EDRs)

EDRs are specific to oral health and used within dental practices, with a narrow breadth and scope of data focused on detailed dental information. This specialization makes EDRs indispensable for dental practitioners but of limited value to other healthcare providers[2]. Furthermore, they are primarily designed for internal use, with limited interoperability.

Electronic Health Records (EHRs)

EHRs have a wide breadth and scope of data and are designed to provide a comprehensive view of a patient's overall health and enable care coordination across multiple healthcare settings. They have intermediate interoperability and may be accessible to multiple healthcare settings, including hospitals, clinics, and specialized care centres[1]. Most modern EHRs also incorporate a patient access portal for enhanced engagement.

Integrated Electronic Health Records (Integrated EHRs)

Integrated EHRs contain a very wide breadth and scope of data, combining information from various healthcare systems, including medical and dental disciplines, into a unified record. Designed for high interoperability, integrated EHRs enhance care coordination and continuity across various healthcare settings[3], providing a comprehensive and holistic view of a patient's health, reducing iatrogenic errors and improving the quality of care.

Understanding the similarities and differences between EMRs, EDRs, EHRs, and integrated EHRs is crucial for healthcare providers in choosing the appropriate record system for managing patient information. While all these systems share features like digital format, patient-centred information, security, and real-time access, they differ in scope, content focus, and usage. By selecting the correct type of electronic record system, healthcare providers can enhance the quality of care, improve patient outcomes, and ensure efficient health information management. The record types are summarized in the following table:

	EMRs	EDRs	EHRs	Integrated EHRs
Type of health data				
Interoperability and data access	● **Limited**	● **Limited**	●● **Intermediate**	●●● **High**
Breadth and scope of health data	● **Narrow**	● **Narrow**	●● **Wide**	●●● **Very Wide**
Examples of data contained	Patient visits, medical diagnoses, medications, treatment plans, follow-up steps, referrals, and test results[1].	Dental history, clinical notes, treatment plans, radiographs, patient demographics, and dental alerts related to dental health[2].	Medical history, diagnoses, medications, treatment plans, immunizations, allergies, imaging, and laboratory results.	Combination of dental and medical data, including core oral and general health indicators.

Additionally, the Personal Health Record (PHR) is another type of digital format health record designed primarily for patients to manage and access their own health data.

Personal Health Records

PHRs are patient-centred digital records that provide a wide to very wide scope of data, allowing patients to access and manage their health information. They may serve as repositories for data from EHRs and integrated EHRs and enable patients to control which information they share with healthcare providers. This empowerment can help increase their engagement and comfort with their healthcare management. PHRs can also integrate data from personal apps and devices, such as diet consumption, blood oxygen levels, electrocardiogram readings, and oral hygiene details. While PHRs generally have limited interoperability with other healthcare systems, the combination of patient-entered data and EHR information can enhance personalized healthcare recommendations.

THE IMPORTANCE OF INTEGRATED ELECTRONIC HEALTH RECORDS

To work towards holistic care and the utilization of combined dental and medical digital health data, this Consensus Statement focuses on integrated EHRs. Before establishing the current status, opportunities, and future of integrated EHRs, it is vital to recognize their potential impact and benefits. Therefore, this section focuses on Objective 1:

Examine the importance and anticipated benefits of the integration of electronic health records.

Advantages of integrated electronic health records

The integration of medical and dental EHRs offers 10 key advantages.

1. Comprehensive care delivery

Seamless communication between hospitals, medical offices, and dental practices is essential for comprehensive care. For example, sharing information about the need for dental care before hospital or medical office discharge can ensure that follow-up dental care occurs if needed. This is important for diseases such as uncontrolled diabetes, where the risk of periodontal disease and subsequent tooth loss is increased.

2. Safer medication management

Integrated EHRs can provide comprehensive digital data on a patient's health and medications for use in e-prescribing systems, promoting a more coordinated, informed, and safer approach to medication management. The advantages of e-prescriptions include a decrease in medication errors, the elimination of medication duplication, increased legibility and accuracy, and automation of alerts for medication conflicts or contraindications (such as medication allergies, interactions, and other medication-associated adverse events). Additionally, the transition to digital prescriptions is viewed as a positive step toward modernizing patient care and reducing opioid misuse.

3. Robust referral

Robust integrated electronic referral systems offer benefits such as referral tracking, patient reminders, provider reminders if patients fail to follow through, and feedback mechanisms. This ensures that referrals are completed and followed up and supports a continuous flow of information between different healthcare providers, improving the likelihood that patients complete care.

4. Holistic patient care

The integration of oral health records within EHRs is essential for providing a holistic view of a patient's health[4]. Including indicators that impact or are impacted by systemic health issues can aid in managing chronic diseases and other noncommunicable diseases (NCDs), such as diabetes, where oral health status significantly influences disease management and outcomes[5]. This comprehensive approach ensures that all aspects of a patient's health are considered in their diagnosis and treatment plans.

5. Improved research and development

Improvements in the collection of a patient's digital health information through integrated EHRs, which include oral health data with diagnostic codes, will provide more comprehensive oral, social, and health data. Enhanced data sharing between oral and medical health records will enable large-scale data analysis utilizing artificial intelligence (AI) models that include oral health concerns.

6. Reduced costs and improved efficiency

Robust integrated EHRs can streamline administrative tasks, improve the efficiency of healthcare services, and potentially reduce costs. For example, utilizing integrated records can decrease redundant tests and procedures.

7. Enhanced disease surveillance for global public health

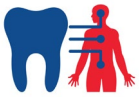
There is a significant opportunity to leverage integrated EHRs in global health initiatives, improving the surveillance and management of diseases and health trends worldwide. This is particularly important for public health disease surveillance in a globalized world.

8. Accelerated technological innovations in healthcare

The push towards integrating EHRs encourages technological innovations, such as developing more sophisticated data analytics tools and using AI to assist in clinical decision-making. The Council of European Dentists (CED) Resolution on AI recognizes the potential of AI to enhance capabilities, efficiency and accuracy, and reduce costs[6].

9. Data-driven health management

Improved data integration has the potential to enhance healthcare delivery, patient outcomes, and operational efficiency. Collecting, managing, and analyzing data from various sources can help healthcare providers make informed decisions and implement effective healthcare strategies. By combining dental and medical data, more comprehensive care can be provided, which may include preventive measures that address both oral and systemic health issues simultaneously.



10. Integrated healthcare systems

Oral health can significantly impact systemic conditions, such as diabetes and the overall burden of inflammation. According to available literature, there is an association/correlation between oral health and cardiovascular diseases (CVDs), although a causative link has not been established[7]. This understanding supports the need for a healthcare model that does not treat oral health in isolation but as an integral part of overall health.

In addition to these advantages, the economic value of implementing EHRs must be considered, as well as the potential implications of integrated records on the transition towards person-centred care.

The economic benefits

A series of small-scale studies conducted across four locations (three in the United States and one in the Netherlands) demonstrated the potential of EHRs to enhance care quality in ambulatory care environments. These studies highlighted that when EHR systems incorporate clinical information management and decision support tools, there is an improvement in provider performance. This is especially true when EHR systems can accurately store, easily retrieve, and effectively translate data into meaningful, context-specific information, thereby empowering healthcare providers in their roles. Despite variations in the analytical methods utilized across these studies, each cost-benefit analysis forecasted significant financial savings from the deployment of EHRs, alongside healthcare information exchange and interoperability. The analyses indicated that the financial benefits from investing in these technologies are likely to exceed the initial costs. However, the period required to achieve a return on investment varied widely, ranging from 3 years to as many as 13 years[3].

Shifting towards person-centred care

An emerging healthcare concept is the “Whole Health Home,” which emphasizes a comprehensive approach to care by integrating oral health, with all healthcare providers working together to promote and improve overall health[8,9].

The Whole Health Home

1. Conceptual framework: The idea of a health home is not confined to a physical location but revolves around patient-centred comprehensive care management[10]. It focuses on holistic care overseen by different community or family figures as well as the "healthcare" system. This team-based, interprofessional approach is rooted in trustful relationships to promote well-being, prevent disease, and restore health in line with individual missions and aspirations.

2. Shift in focus: There is a shift from a reactive, disease-oriented medical system to one that prioritizes disease prevention and overall well-being. This involves changing the healthcare conversation from "What's wrong with you?" to "What matters to you?"[11]

3. Definitions and integration: Clear definitions in healthcare are crucial, as well as discussions on how whole health encompasses physical, behavioural, spiritual, and socioeconomic well-being[11]. Additionally, oral health should be integrated into the model, highlighting that dental care is part of overall health. The seamless transfer of crucial health information from health records to healthcare providers is essential for effective patient management.

4. Transdisciplinary/multidisciplinary care: Extending interprofessional care to "transdisciplinary" care involves integrating knowledge from various disciplines, both scientific and non-scientific, to comprehensively address health. This approach extends beyond traditional healthcare boundaries to include fields like urban planning and sociology[8].

Linking health records to personal devices could further extend monitoring and management capabilities, thereby broadening the scope for health improvement. With the introduction of digital devices that patients wear and utilize, ranging from Bluetooth toothbrushes to cardiac monitors/pulse oximeters in watch-like devices and devices monitoring exercise/activity, diet, stress, and a variety of other parameters, it is possible to get a much more comprehensive picture of an individual if all this data can be brought together in shared systems. This patient-centred approach ensures that healthcare providers have all the necessary information to make informed, shared decisions regarding patient care. The growing availability of new AI algorithms and their introduction into the healthcare system has the potential to apply more advanced reviews of the comprehensive health record to inform all aspects of patient care.

Transforming healthcare delivery

Health Information Technology (HIT) possesses the capacity to fundamentally transform healthcare delivery, rendering it safer, more effective, and more efficient. Some organizations have seen considerable improvements by adopting comprehensive, interoperable HIT systems centred around an EHR. However, the broader application of HIT remains hampered by a limited universal understanding of which HIT variants and implementation strategies effectively enhance care and manage costs across different healthcare settings[12].

CURRENT STATE OF ORAL HEALTH INTEGRATION

Use and integration of digital oral health electronic records

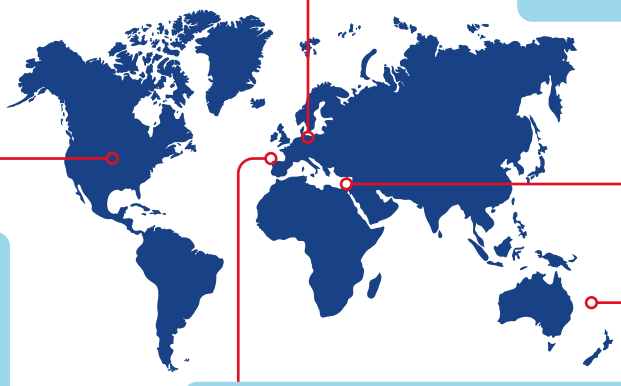
This section focuses on Objectives 2 and 3:

2 Determine the current state of utilization of digital oral health electronic records globally.

3 Determine the current level of integration between oral health and other health information systems.

Several studies have investigated the global adoption of EMRs and EHRs.

Global hotspots (2015):
It was reported that nearly 100% of physicians from Australia, the Netherlands, New Zealand, Israel and Germany utilized an EMR[12].



United States (2015):
EMR adoption, in some form, had been achieved by only 59% in the United States[12].

Europe (2017):
A study by Fragidis and Chatzoglou[13] found that 19 of 33 European countries were still at the planning stage for national EHRs. Eight countries had provided unique health identifiers to citizens.

However, there are limitations to the available literature. A scoping review was conducted to further investigate the status of oral health integration worldwide and identify any specific gaps in the literature.

Scoping review: Examining the global dissemination of integrated dental and medical electronic health records

A scoping review (unpublished data) following the framework by Arksey and O'Malley[14] was conducted to investigate the integration of EHRs in dentistry and the global landscape of both integrated and non-integrated healthcare records. The review examined how information from these records can benefit healthcare professionals and patients, focusing on oral health indicators.

The review followed a structured methodology, involving database searches, screening, and data extraction based on predefined inclusion and exclusion criteria (Appendix 1). This rigorous process ensured a comprehensive analysis of available literature. One significant finding was the limited amount of scientific literature on integrated EHRs, especially those that include dental data. From over 1,000 initial articles, only 15 met the criteria for inclusion in the final analysis. The bibliography can be found in Appendix 2.

In addition, a survey conducted by the Oral Health Group of the World Federation of Public Health Associations explored the current state of integration between dental and medical records globally. The survey received responses from 110 participants across more than 50 countries. The survey findings supported those from the scoping review summarized below.

Summary: Key findings from the scoping review

Existing research: The report found limited specific literature on integrated EHRs, with further limitations to the existing research including lack of standardization, evaluation, and limited scope (e.g., focusing on institutional settings and the United States).

Oral health indicators: Only five studies reported on oral health indicators. Even in studies discussing the same EHRs, there was inconsistency in reported oral health indicators, suggesting a lack of standardization in capturing and sharing oral health data within integrated EHRs. Oral health indicators mentioned included basic metrics such as the number of missing teeth and other dental statuses, which could indicate general oral health conditions.

The scoping review found the following limitations to the existing research on EHR integration:

Scarcity of literature

There is a limited amount of scientific literature focused specifically on integrated EHRs that combine dental and medical data, indicating a significant gap in research and published material in this area.

Lack of standardization

The absence of standardized terminology for describing integrated EHRs complicates communication and collaboration across different healthcare domains, leading to confusion and inefficiencies.

Geographic concentration

The majority of studies on integrated EHRs originate from the United States, suggesting a need for more diverse global research efforts.

Focus on institutional settings

Existing studies mostly involve institutional or large healthcare system contexts, with a lack of research from solo dental practices, where a significant proportion of dental care occurs.

Evaluation and usability

Evaluations of the effectiveness and usability of integrated EHRs are infrequently reported, limiting understanding of the system's impact on healthcare delivery.

Data sharing and indicators

There is inconsistent reporting on the specific data shared between dental and medical records, and oral health indicators are rarely detailed in a standardized form.

The scoping review underlined the importance of integrating oral health indicators into EHRs while also highlighting the challenges and gaps in current practices. It emphasized the need for a consistent framework to document and utilize oral health information within integrated health records systems. The findings demonstrated the need for further research to address these gaps, particularly in developing standardized terminology, exploring integration across diverse healthcare settings, and evaluating the benefits and challenges of integrated EHRs. The review also bought to light some practical steps for improving integration, such as developing common languages for EHR systems, involving private practices in research, and enhancing the visibility and accessibility of oral health data within general health records.

CHALLENGES TO INTEGRATION AND DATA SHARING

An overview of key barriers

This section will focus on Objective 4:

Determine the current challenges to integration and data sharing between health information systems.

Achieving interoperability between electronic dental and medical records faces significant challenges, primarily in the sharing of information. The independent construction of these systems requires a universally agreed-upon communication standard to be successful. The presence of competing data and transaction formats complicates the integration and sharing of information. To effectively incorporate oral health indicators in an EHR and general health indicators in an EDR, several hurdles need to be overcome as addressed below.

Standardization

The adoption of a standard methodology is crucial for the seamless exchange and utilization of data[15]. However, standardization remains one of the primary challenges in integrating electronic dental and medical records, as it hinders interoperability between existing EDR and EHR systems. Key challenges include:

Terminology variability

Clinical terminology varies widely across different regions and systems, leading to challenges in effective data exchange. Dental records often do not utilize medical codes for recording diagnostic information, which further complicates information sharing.

Data format variability

Standardized coding and data formats must be used, complicating data sharing and integration. This issue extends globally, affecting international collaboration and consistency in healthcare data management.

Documentation style

Differences in documenting health information between dental and medical record systems pose a challenge to direct data integration. Dental systems primarily use visualization methods such as odontograms, while medical records are more text focused.

Infrastructure limitations

Some dental practice management systems lack the necessary infrastructure to support interoperability with medical systems, hindering data exchange. This would include their inability to utilize Health Level Seven (HL7) standards and Fast Healthcare Interoperability Resources (FHIR) protocols as examples.

HL7 standards and FHIR protocols are key components in the healthcare industry for facilitating the exchange of information between different healthcare systems.

- HL7 standards are a set of international standards for the transfer of clinical and administrative data between software applications used by various healthcare providers. The main aim of HL7 is to provide a framework for the integration, exchange, sharing, and retrieval of electronic health information.

- FHIR is an HL7 standard specifically designed to enable healthcare data exchange through modern web-based applications. It is a more recent and flexible standard that leverages Representational State Transfer Application Programming Interfaces (RESTful APIs), which is a set of rules that allows different software applications to communicate over the internet, making it easier to implement compared to earlier HL7 standards.

Stakeholder engagement

Encouraging healthcare professionals and all stakeholders to adopt digital practices is essential to successful integration. Challenges to achieving this include:

Resistance from professionals

Some healthcare professionals, including dentists, may resist adopting new digital practices due to comfort with traditional methods, fear of litigation, or scepticism about the benefits of digital records compared to established routines.

Inclusive engagement

To achieve success, all stakeholders, including healthcare providers, EHR systems developers, regulatory bodies, transmission facilitators, and patients, need to actively participate.

Usability

The usability of EHR systems often varies, which can deter end-users and slow down integration efforts.

Data and security

An increase in digital data and the sharing of information inevitably comes with challenges in the storage and security of this data:

Data overload

The transition from paper to electronic records introduces the challenge of managing vast amounts of digital data. There is a risk of data overload, where critical information can be obscured, complicating clinical decision-making.

Legal and regulatory issues

Navigating the complex landscape of legal and regulatory requirements for EHRs poses a challenge, especially when considering the privacy and security of patient data across different regions with varying regulations.

Data privacy and security concerns

An increase in digital health records brings a heightened risk of data breaches and cybersecurity threats. Protecting patient information is paramount, raising concerns about the security measures in place and the potential misuse of data, particularly by insurance companies. Some EDR systems may not meet the stringent security standards required by medical counterparts, leading to reluctance to share sensitive data due to potential security breaches and non-compliance with government regulations. A secure authentication for all users must be assured.

Cost

The integration of comprehensive health record systems is often complex and expensive. As well as overcoming the costs, challenges for stakeholders include:

Demonstrating long-term results

There is a need to demonstrate that these costs will significantly improve population health and convince relevant stakeholders that alignment and standardization are necessary for long-term success.

Building on existing systems

To reduce costs, strategies need to build on existing systems rather than attempting to replace them entirely. However, these changes can be cost-prohibitive and technically challenging.

International coordination

While most countries must address challenges related to standardization, engagement, security, and cost, additional obstacles are specific to the adoption of EHR integration on an international scale.

Cultural and regulatory barriers

Different countries and dental practices face various regulatory and cultural hurdles affecting the adoption and integration of oral health information into digital health records.

Disparities in adoption

Significant variance exists in how digital health systems are adopted and utilized across different dental practices and countries. Factors influencing these disparities include technological infrastructure, regulatory environments, privacy concerns, availability of high-speed internet, and cultural attitudes toward the application of digital technologies and innovations in the healthcare sector. Implementation may be driven by government standards in some regions, while others follow a more voluntary approach.

Global and regional differences

There is a need for global cooperation in standardizing the use and sharing of health data. Governmental funding for integrated EHRs, as well as regulatory requirements, vary nationally. Little drive for transnational standardization has been reported outside regions like the European Union. The European Health Data Space (EHDS) initiative could be a step towards consolidating health data across Europe, which may serve as a model for other regions.

OPPORTUNITIES FOR INTEGRATION AND DATA SHARING

Despite the challenges described, there are opportunities to align dental and medical record systems by adopting common terminology, improving infrastructure, involving all interested parties, and considering the appropriate use of oral and general health indicators.

Standardized terminology

The adoption of common diagnostic standards, such as SNOMED CT* and/or ICD+, will allow for the transmission of important health indicators across various platforms. This terminology will also ensure a common understanding of the terms across different regions, practices, and healthcare providers.

Improved infrastructure

Various entities and methodologies exist to share information. Health Information Exchanges could provide a good opportunity for dental practice systems to reduce the resources needed to transfer information between providers. These exchanges are designed to collect and distribute information from various sources. While not available worldwide at this time, their expansion could be one of the solutions.

Stakeholder collaboration

It will be critical to involve all interested parties in developing a common approach. This will help prevent competing solutions from emerging, which could slow down the universal sharing of information. Understanding that health indicators are essential data to be shared universally, and avoiding competition for one solution over another, will be crucial.

Focused data sharing

Too many indicators will result in slower adoption. Limiting the data set to the most important oral and general health indicators will lead to easier implementation and greater use. How these limited indicators are displayed to the end-user in an EHR will also greatly influence their effectiveness. If they are not displayed in an obvious and easily accessible manner, they will most likely be of little use.

*SNOMED CT: Systematized Nomenclature of Medicine – Clinical Terms; +ICD: International Classification of Diseases.

Improving the interoperability of health record systems will ensure that oral health data are not isolated but are integrated into understanding and managing overall patient health. Standardization is essential for shared health information systems to be usable by the general medical profession. In the world today, there are approximately 7,000 languages and dialects. This creates natural boundaries and obstacles. Similarly, if a common language is not utilized in healthcare, such boundaries and obstacles will persist.

CORE ORAL AND GENERAL HEALTH INDICATORS TO SHARE BETWEEN HEALTH INFORMATION SYSTEMS

It is important to recognize the vast amount of health data that can be stored in digital health records. Limiting this to the most important data for oral and general healthcare involves identifying core oral and general health indicators.

This section will focus on Objective 5:

Determine a core set of oral health indicators that should be integrated with other health records to optimize overall health outcomes, improve the quality of healthcare, and enhance patients' quality of life.

Failing to manage the transfer of data from an EDR into an integrated EHR may restrict the use of that data to improve patient health. For instance, details such as the types of anaesthetics and materials used in dental procedures, as well as tooth numbers and restored surfaces, may not be crucial to primary healthcare providers. Conversely, knowledge about chronic inflammation from periodontal disease and dental cavities, potentially caused by excessive sugar consumption, could significantly impact overall healthcare. Therefore, it's essential to include a core set of oral health indicators in the routine transmission of data from EDRs to integrated EHRs. The following core oral health indicators are recommended.

Core oral health indicators

Oral health indicator	Rationale
Periodontal disease	Periodontal health is a crucial aspect of oral health. Including screening results can help assess the risk or presence of gum disease, which is associated with systemic health issues like diabetes and heart disease. Attributes of periodontal disease, such as inflammation, can be related to similar attributes in systemic conditions using standardized data systems like SNOMED CT. This connection could aid in developing decision-support tools that incorporate oral health considerations into general medical practice.
Caries and endodontic health	Caries is the most common noncommunicable disease that can affect school, work, and family routines. Prevention and early intervention by health professionals can reduce common dental issues that could serve as indicators of broader health issues or contribute to systemic health data.
Oral cancer screening/ examination	It's important to monitor suspicious lesions, oral potentially malignant disorders (OPMD), and identify risk factors that elevate the risk of disease presence.
Oral health status measures and the need for oral health promotion and care	It's important to incorporate an oral health risk assessment for oral cancer, caries, and periodontal disease in general health risk assessment and abatement.
Medical devices and implants information	Including detailed information about any dental implants or devices in medical records is crucial. The specific type of implant or device can significantly influence medical decisions, such as the type of MRI a patient can safely undergo and the management of these patients in emergency or operative settings.

Prescription data	Including e-prescription data within health records could help manage and monitor prescribed medications for patients. This is particularly important for the prevention of adverse drug interactions, as well as medications that affect oral health, such as those impacting saliva production, which can significantly influence dental health.
Allergies and medical history findings	Sharing data on any newly disclosed allergies, especially to medications or materials used in dental treatments, is crucial.
Radiographs and other diagnostic images	Integrating dental radiographs and other diagnostic images into medical records can aid in diagnosing conditions that affect both dental and general health, providing a more comprehensive view of a patient's health status.

Integrating these indicators into a unified health record system would not only enhance the quality of dental care but also ensure that oral health considerations are part of the overall healthcare strategy, reflecting the interconnectivity between oral and general health. This integration would facilitate more informed and coordinated care decisions across different healthcare disciplines.

Core general health indicators

This section will focus on Objective 6:

Determine the essential core health data that should be shared with the oral health record to optimize health outcomes, quality of oral healthcare, and patient quality of life.

The data from EMRs and EHRs that are required for oral healthcare and should, therefore, be included in an integrated EHR system and routinely imported into EDRs, starts with confirming patient identification and demographic information. Most EHR systems feature a health summary containing multiple diagnoses and procedure codes describing treatments being received. These summaries generally encompass patient allergies, current medications, and conditions currently under treatment. As lifetime EHRs can contain copious amounts of information, a strategy is needed to effectively parse the incoming data. A suggested strategy for managing the query of health data asks these three questions:

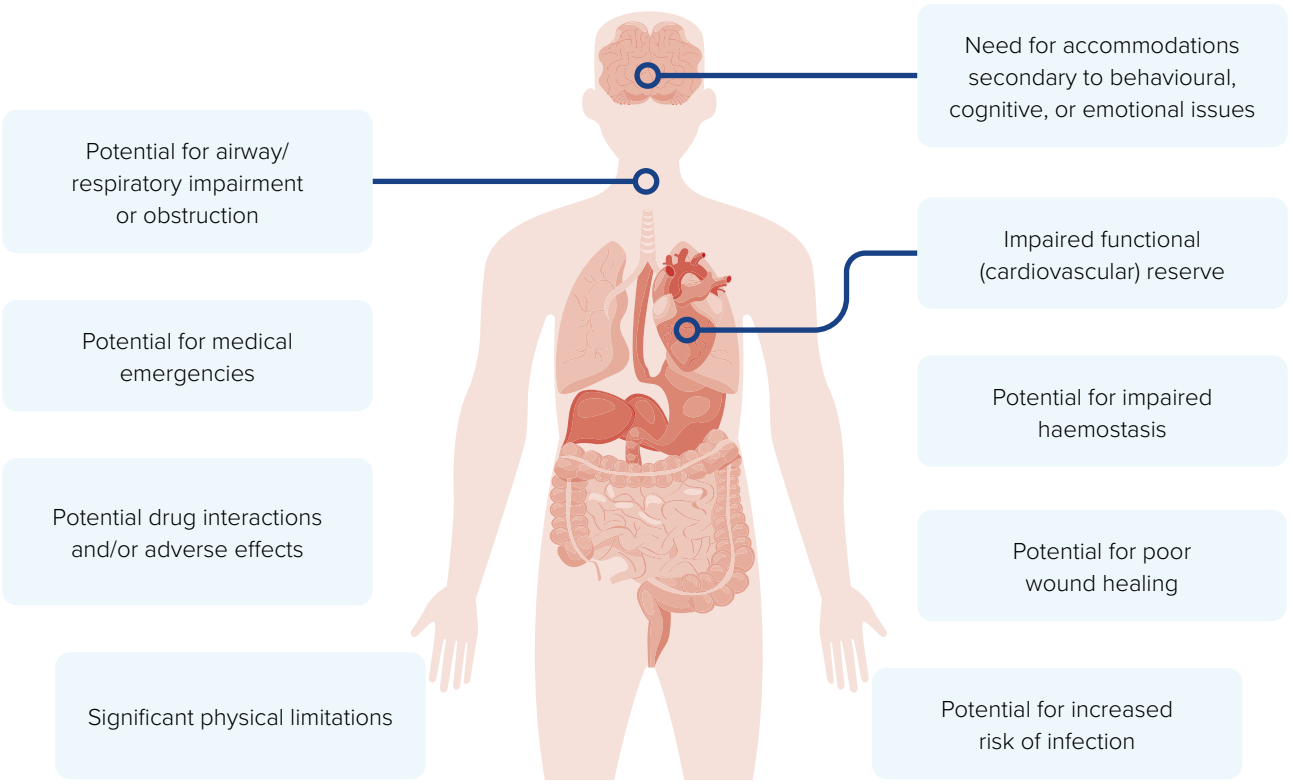
1. **Do the patient's underlying medical conditions affect their oral health, or does their oral health affect their general health?**

2. **Does the patient's medical history necessitate the cautious modification of planned dental care to achieve a successful treatment outcome?**

3. **What details in the patient's medical history raise the probability of the patient encountering a negative outcome as a result of the intended dental treatment?**

Conditions from a patient's EHR health history that may indicate a need to alter oral treatment, and should therefore be included in an integrated EHR and routinely imported into EDRs, are shown in the following figure.

Key health conditions that may impact oral treatment



Additionally, it's important to note the patient's history of bisphosphonate therapy and radiation therapy, as these can be relevant for dental procedures due to the risk of osteonecrosis of the jaw and the impact on oral health and treatment options, respectively[16,17].

IMPLEMENTING INTEGRATED ELECTRONIC HEALTH RECORDS

The Consensus Statement thus far has described key benefits, challenges, opportunities, and health indicators, all of which are important to consider when implementing integrated EHRs. This section, introduces some core implementation strategies before detailing recent policy changes that could help advance the goal of integrating EHRs.

Implementation strategies

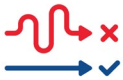
The following implementation strategies can facilitate the successful integration of EHRs:

Stakeholder engagement

Develop strategies for engaging key stakeholders, including dentists, physicians, IT professionals, and patients.

Training and education

Provide recommendations for the training of healthcare providers on the use of integrated EHRs. To digitally revolutionize the healthcare system, an educated, well-trained workforce is paramount. Starting at university level, embedding digital skills education into the dental studies curriculum should be a priority. As part of their professional lives, dentists should address the increased need for improved digital skills through continuing professional development (CPD) arrangements.



Pilot programmes

Run pilot programmes to identify and resolve potential issues before widespread implementation.

The earlier scoping review identified infrequent reporting on the effectiveness and usability of integrated EHRs. Implementing effective evaluation and quality assurance is essential to the integration of EHRs, including:

Monitoring and evaluation

Outline methods for ongoing monitoring and evaluation of the integration process and its impact on patient care.

Continuous improvement

Encourage the use of feedback to continuously improve the system and its usability.

Ethical Considerations

When integrating EHRs into dental practice, it is the ethical obligation of the profession to ensure the protection of patient privacy and confidentiality. Implementing robust security measures that restrict access to authorized individuals only is essential, and patients should be informed about how their data will be used and shared. Maintaining accurate records is also crucial. Integrating advanced health information systems and digital technologies is vital for embedding oral health within broader healthcare frameworks. Such technologies enhance service management, improve accessibility, enhance safety, and raise the overall quality of care. Accurate data supports optimal patient care, evidence-based decision-making, tracks progress and optimizes resource allocation.

Digital tools, including telemedicine, teledentistry, EHRs, and mobile health (mHealth) applications, contribute to improved efficiency, sustainability, and continuity of care. Innovative technologies facilitate real-time disease tracking, remote access, and early detection—key components for effective oral health promotion and management. Clear and transparent communication is necessary to secure informed consent and ensure the best interests of both patients and healthcare systems.

Policies to support integration of oral health indicators

Transformative times for oral healthcare

For decades, there have been strong motivations to integrate electronic health and medical records with oral healthcare records. In the United States, the American Recovery and Reinvestment Act of 2009 allocated $34 billion to promote the adoption of electronic records in oral health and medicine. Additionally, it incentivized “Meaningful Use” changes for practitioners and institutions. Despite this, the integration achieved only minimal success, even with the introduction of Medicare and Medicaid incentive programmes.

Since 2021, there have been significant developments in the global oral health landscape, marking a transformative period characterized by a united commitment to increase access to affordable and timely oral healthcare worldwide. The catalyst for this change was the adoption of a landmark Resolution on Oral Health by WHO Member States in May 2021.

WHO Resolution on Oral Health: Seventy-Fourth World Health Assembly (2021)

The Resolution on Oral Health recommended firmly embedding oral health within the NCD agenda and incorporating oral healthcare interventions into universal health coverage (UHC) programmes[18,19].

WHO Global Strategy on Oral Health (2022)

The WHO developed strategies to promote oral health and prevent and manage oral diseases. It sought to enhance efforts to integrate oral diseases and conditions into UHC and explored the development of targets and oral health indicators[20].

WHO Global Strategy and Action Plan on Oral Health (2023–2030)

Building on the strategy, the WHO outlined a comprehensive action plan for improving oral health surveillance, data collection, and monitoring to inform decision-making and advocacy, including a framework for tracking progress with targets set for 2030[21].

Bangkok Declaration – No Health Without Oral Health: Towards Universal Health Coverage for Oral Health by 2030 (2024)

WHO Member States adopted the Bangkok Declaration, which included a clear call to action underscoring the need for sustained commitment and collaboration to recognize oral health as a fundamental component of global health[22].

EU Regulation: Introducing the European Health Data Space (2025)

A new EU Regulation established the European Health Data Space (EHDS), aiming to ease patient’s access to personal electronic health data while also facilitating health data exchange and access across member states[23].

These recent strategies and regulations underscore the urgency and significance of this Consensus Statement, which actively supports and promotes these efforts. More detail on the most recent policies reveals clear links to the necessary changes and progressions described in this Consensus Statement relating to the collection, exchange, and security of data.

WHO Global Strategy and Action Plan on Oral Health (2023–2030)

The WHO's action plan aligns with several of the key themes of this Consensus Statement, including the importance of standardization and integration of EHRs. Specifically, the actions described by the WHO include developing and standardizing updated methods and technologies for gathering oral health epidemiological data, integrating electronic dental and medical records, and strengthening the integrated surveillance of oral diseases and conditions.
A key global target is established under *Strategic Objective 5: Enhancing Surveillance and Health Information Systems*. This objective aims to provide timely, relevant feedback on oral health to decision-makers, thereby facilitating evidence-based policymaking. A key component of this target is the integration of electronic oral health records into broader medical and pharmacological records.

5 GLOBAL TARGETS FOR STRATEGIC OBJECTIVE 5

Global target 5: Monitoring implementation of the national oral health policy

Action 80. Integrate electronic patient records and protect personal health data:

Encourage integration of electronic oral health patient records into medical and pharmacological records and sharing data among public and private providers, to facilitate continuity of people-centred care as well as population-level health monitoring. Establish data protection and confidentiality regulations that protect patient-related information while allowing anonymized data analysis and reporting, in accordance with national context. Ensure that patients have access to all information recorded and stored about them.[21:p.34]

EU Regulation: Introducing the European Health Data Space (2025)

The introduction of the EHDS represents another step forward in addressing some of the challenges outlined in this Consensus Statement, such as the development of a standardized EHR framework and protecting the security of patient data.
The Regulation aims to help optimize data exchange and access, thereby streamlining healthcare delivery and research.

One of the most relevant goals of the Regulation is to create a uniform framework for the development, marketing, and use of EHR systems:

> "In addition, this Regulation's goal is to improve the functioning of the internal market by laying down a uniform legal and technical framework in particular for the development, marketing and use of electronic health record systems ('EHR systems') in conformity with Union values"[23]

The proposal provides for a health-specific data environment, including common rules, infrastructure, and a governance framework. The Regulation recognizes the sensitivity of health data and aims to provide safeguards at a Union and national level to ensure the secure, confidential, and ethical use of data.

FDI's Vision 2030: Delivering Optimal Oral Health for All

The key policy frameworks outlined here align not only with this Consensus Statement but also with *FDI's Vision 2030: Delivering Optimal Oral Health for All*[24], which sets an ambitious agenda for achieving universal oral health coverage by 2030. Vision 2030 emphasizes the importance of integrated practice management software and electronic patient records in providing a comprehensive view of patient health information, ultimately supporting better clinical decision-making.

Advocacy and financing strategies to support implementation

Policy and advocacy recommendations to support the integration of oral health indicators into EHRs, along with potential sources of funding and resources necessary for successful implementation, are outlined below[21].

Policy and advocacy recommendations

Improved patient care

Recommendation

Advocate for the incorporation of oral health indicators into integrated EHRs to enhance healthcare service delivery. This integration enables healthcare providers to access comprehensive patient information, leading to improved diagnosis, treatment planning, and continuity of care.

Rationale

- Integrated EHRs offer the opportunity to enhance patient care by providing a holistic view of a patient's health records, facilitating better diagnostic and treatment plans that consider both dental and medical histories.
- Ensuring dental indicators are included in overall health records supports comprehensive, continuous, and coordinated care across different healthcare providers, reducing the risk of errors and omissions in patient information. It also facilitates better health outcomes through the provision of timely and relevant health services.
- Educating patients about the benefits of integrated EHRs and ensuring they have access to their health information can enhance patient engagement and improve health outcomes. Patients who are informed and involved in their healthcare decisions are more likely to follow treatment plans and engage in preventive care.

Oral health information and research

Recommendation

Incorporate oral health data in national health surveillance systems using integrated EHRs to close information gaps and enhance the monitoring of oral diseases as part of comprehensive NCD surveillance.

Rationale

- By collecting and monitoring oral health data through integration into national health surveillance and monitoring systems, particularly within ongoing NCD surveillance, significant data and information gaps related to oral diseases can be addressed. Leveraging integrated EHRs for this will ensure comprehensive and accurate health tracking.
- Integrated EHRs can significantly boost research opportunities by providing a richer, more comprehensive data set. Researchers can study trends, outcomes, and efficacy across a broader spectrum of health data, potentially leading to breakthroughs in both fields.
- Surveillance of oral health conditions and the effectiveness of interventions can be helped by integrated EHRs, ensuring that healthcare providers have access to up-to-date and accurate patient information.
- Integrated EHRs allow for the aggregation of large amounts of health data, which can be used for research and population health management. Insights from data analytics can lead to better public health strategies, more targeted health interventions, data-driven decision-making, and overall cost savings by addressing health issues proactively.

Health-systems strengthening

Recommendation

Promote integrated EHRs as a crucial component of incorporating oral health into primary healthcare (PHC) and universal health coverage (UHC) frameworks, facilitating comprehensive patient management and continuity of care across different health services.

Rationale

- WHO's Global Oral Health Action Plan calls for the integration of essential oral health care into PHC models and UHC benefit packages. This would logically involve incorporating oral health into integrated EHRs to ensure comprehensive patient management and continuity of care.
- WHO's oral health resolution highlights the importance of strengthening the provision of oral health services as part of the essential health services package that delivers UHC. This implies that oral health services should be integrated into the overall health system, including digital health records, to ensure that all aspects of healthcare are accessible and coordinated.
- Incorporating oral health indicators into broader health monitoring frameworks could lead to better management of chronic conditions and improvements in overall health system performance. It is also crucial for informing planning, management, and policymaking.
- Streamlined access to patient records reduces the time healthcare providers spend on administrative tasks, allowing more time for patient care.

Digital health technologies and innovation

Recommendation

Drive the integration of EHRs to spur technological innovation, including the development of advanced data analytics tools and the use of AI to enhance clinical decision-making.

Rationale

- Robust health information systems and digital technologies are crucial for integrating oral health into broader healthcare frameworks, thereby enhancing the management, accessibility, and quality of health services.
- Accurate data are crucial for tracking progress, identifying trends, and making informed evidence-based decisions regarding public health strategies and resource allocation.
- The use of digital technologies, such as telemedicine, teledentistry, and EHRs and mHealth can help support dental practices to be sustainable and efficient. This includes utilizing digital platforms to deliver oral healthcare and integrating these services with EHRs to improve access and continuity of care.
- Innovative technologies can provide accurate, real-time data for disease tracking and management and play a role in delivering accessible, effective oral health promotion and essential oral healthcare. This includes improving remote access and consultation by using telemedicine and teledentistry for early detection and referral to services for the management of oral diseases and conditions.

Interoperability and standardization

Recommendation

Champion the standardization of digital health records to ensure interoperability, security, and privacy across different health systems and regions. This can be supported through legislation that enforces the use of standardized data formats to allow seamless exchange between dental and medical health records.

Rationale

- Standardizing digital health records can enhance data sharing and coordination among healthcare providers, improving patient outcomes and efficiency in healthcare delivery.
- Standardizing data fields within digital health records ensures that the information collected is consistent, reliable, and useful across different systems and practices. This standardization is crucial for the meaningful exchange of information and for enabling comparisons and benchmarks across providers and regions.
- Integrated EHRs foster better communication and collaboration among healthcare providers, including doctors, dentists, pharmacists, and specialists.
- Standardized records facilitate coordinated care management, especially for patients with chronic conditions or multiple healthcare needs. This leads to improved systemic health outcomes.

Public-private partnerships

Recommendation

Build sustainable partnerships with the private sector to support the development of state-of-the-art digital health record systems that are user-friendly, secure, and interoperable.

Rationale

- Private sector companies are key partners in incorporating oral health indicators into integrated EHRs, bringing expertise in AI, machine learning, and other digital technologies to enhance these systems.
- Tech companies can offer comprehensive training for healthcare providers and staff, ensuring proficiency in using digital health record systems and integrating new functionalities effectively.
- Private sector firms can create customizable digital health record solutions tailored to the specific needs of various healthcare providers, ensuring compatibility with other healthcare applications such as lab systems, pharmacy management systems, and medical devices.
- Companies specializing in cybersecurity can provide robust solutions to protect sensitive health information from breaches and cyberattacks, ensuring the integrity and security of integrated EHR systems.
- The private sector can offer tools and services that help healthcare providers comply with regulations facilitating secure and compliant management of health data.

Potential sources of funding and resources

The incorporation of oral health indicators into integrated EHRs can be financed through several approaches:

Government funding and incentives

Governments could provide financial incentives for the adoption of EHR systems that integrate oral health indicators. This could include grants, subsidies, or tax benefits for healthcare providers who upgrade their systems to include dental data. Regulatory frameworks and national health policies could support funding initiatives that prioritize the integration of oral and general health records to improve overall health outcomes.

Insurance companies

There are several insurance companies already working on integrating medical and dental records. These companies could offer financial incentives or lower premiums for healthcare providers and patients who utilize integrated EHR systems. This approach could enhance health management through better data integration, leading to improved health outcomes and cost savings by reducing duplicative services.

Public-private partnerships

Collaborations between public health bodies and private companies could mobilize resources for the development and implementation of integrated EHR systems. These partnerships could leverage the expertise and funding capabilities of private entities to support public health objectives.

Value-based care models

Transitioning from fee-for-service models to value-based care could provide financial incentives for incorporating oral health indicators into integrated EHRs. Under value-based care, reimbursements are tied to health outcomes rather than the volume of services provided, encouraging comprehensive and coordinated care that includes dental health.

Research grants and funding

Funding from research institutions and public health organizations could be directed towards studies and pilot programmes that explore the incorporation of oral health into integrated EHRs. These initiatives could generate evidence to support broader implementation and highlight the economic and health benefits of integrated records.

By leveraging these various funding sources and financial incentives, the incorporation of oral health indicators into integrated EHRs can be effectively supported and implemented, leading to better health outcomes and more efficient healthcare delivery systems. Collaboration and partnerships across public and private sectors, as well as among different stakeholders, are key to achieving successful integration[25].

CONCLUSION

The integration of oral health indicators into EHRs is essential for achieving comprehensive healthcare and universal health coverage. This integration enhances the ability to monitor and address oral health disparities, informs policymaking, and improves patient care. Through coordinated efforts, the global health community can ensure that oral health is recognized as a vital component of overall health and well-being. Fully leveraging this technology can significantly improve healthcare quality and drive impactful research. It fosters interprofessional collaboration by facilitating information sharing across healthcare settings, leading to better continuity of care, more accurate diagnoses, and timely interventions.

To translate the insights from this Consensus Statement into actionable measures, the following steps can be undertaken:

- **Standardize oral health data integration:** Establish best practices for incorporating oral health indicators into existing EHR frameworks.
- **Pilot and implement integrated EHR Systems:** Test the feasibility of integrating dental and medical records through pilot programmes.
- **Enhance stakeholder engagement and training:** Develop education and training programmes for healthcare professionals to optimize the use of integrated EHRs. Additionally, engage patients, healthcare providers, and policymakers in discussions about the benefits of a unified health record system.
- **Secure policy and regulatory support:** Collaborate with regulatory bodies to address legal and security concerns, ensuring data privacy and protection.
- **Establish sustainable funding models:** Seek government funding, public-private partnerships, and insurance incentives to support implementation efforts.
- **Advance research and innovation:** Leverage integrated health records to promote data-driven decision-making, artificial intelligence (AI) applications, and public health surveillance.

By taking these targeted actions, stakeholders can create a seamless, interoperable healthcare system that fully integrates oral health into general medical care, enhancing patient experiences, improving provider efficiency, and elevating global health outcomes.

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- Prof. Mark Wolff (US), Morton Amsterdam Dean, University of Pennsylvania School of Dental Medicine
- Lina Weinert M.Sc. (Germany), Research Associate, Heidelberg University Hospital, Heidelberg Institute of Global Health, Section for Oral Health
- Dr Jina Linton (South Korea), Member of the FDI Dental Practice Committee
- Dr Piret Väli (Estonia), Member of the Board of the Estonian Dental Association
- Dr Fred Horowitz (US), Executive Chair, OpenView Consulting, LLC

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Contributors to the consensus process

FDI Electronic Health Records Task Team	• Prof. Mark Wolff (US), Morton Amsterdam Dean, University of Pennsylvania School of Dental Medicine. • Lina Weinert M.Sc. (Germany), Research Associate, Heidelberg University Hospital, Heidelberg Institute of Global Health, Section for Oral Health • Dr Jina Linton (South Korea), member of the FDI Dental Practice Committee • Dr Piret Väli (Estonia), Member of the Board of the Estonian Dental Association • Dr Fred Horowitz (US), Executive Chair, OpenView Consulting, LLC
American Dental Association	• Dr Dan Klemmedson (US), FDI National Liaison Officer • Dr Krishna Aravamudhan, Sr. Vice President, Practice Institute • Dr Marko Vujicic (US), Chief Economist & Vice President, Health Policy Institute • Rebekah Fiehn (US), Director, Benefits, Coding and Dental Data Exchange, Practice Institute
American Heart Association	• Brooke McSwain (US), Senior National Policy Research Analyst
CareQuest Innovation Partners	• Katie D'Amico (US), Lead
Center for Integrative Global Oral Health, School of Dental Medicine, University of Pennsylvania	• Prof. Michael Glick (US), Fields-Rayant Endowed Professor and Executive Director
Colombian Dental Association	• Dr Maria Fernanda Mondragon (Colombia), Colombian Dental Association
Council of European Dentists Working Group on E-Health	• Dr Alexander Tolmeijer (Netherlands) DDS, Chair • Dr Peter Kukolik (Slovakia), DDS, Member

Estonian Dental Association Council	• Dr Marek Vink (Estonia), DDS, Chair
Health Care Systems Research Network	• Dr Marek Vink (Estonia), DDS, Chair
HUC (111 service provider)	• Dr Yasmin Allen (UK), BDS, Clinical Director of Dental Care
Kings College London; Chief Clinical Information and Clinical Safety Officer in Health IT	• Dr Tashfeen Kholasi (UK), BDS, Clinical Lecturer in Sedation & Special Care Dentistry
Oral Health Working Group of World Federation of Public Health Associations	• Dr Aarthi Shanmugavel (US), Consultant, Health Informatics and Dental Public Health
Pontifical Javeriana University	• Prof Enrique Peñaloza Quintero (Colombia), Associate Professor, Institute of Public Health, Vice President of Research
UCLA School of Dentistry	• Prof. James Crall (US), Professor Emeritus
World Medical Association	• Dr David Barbe (US), Past President

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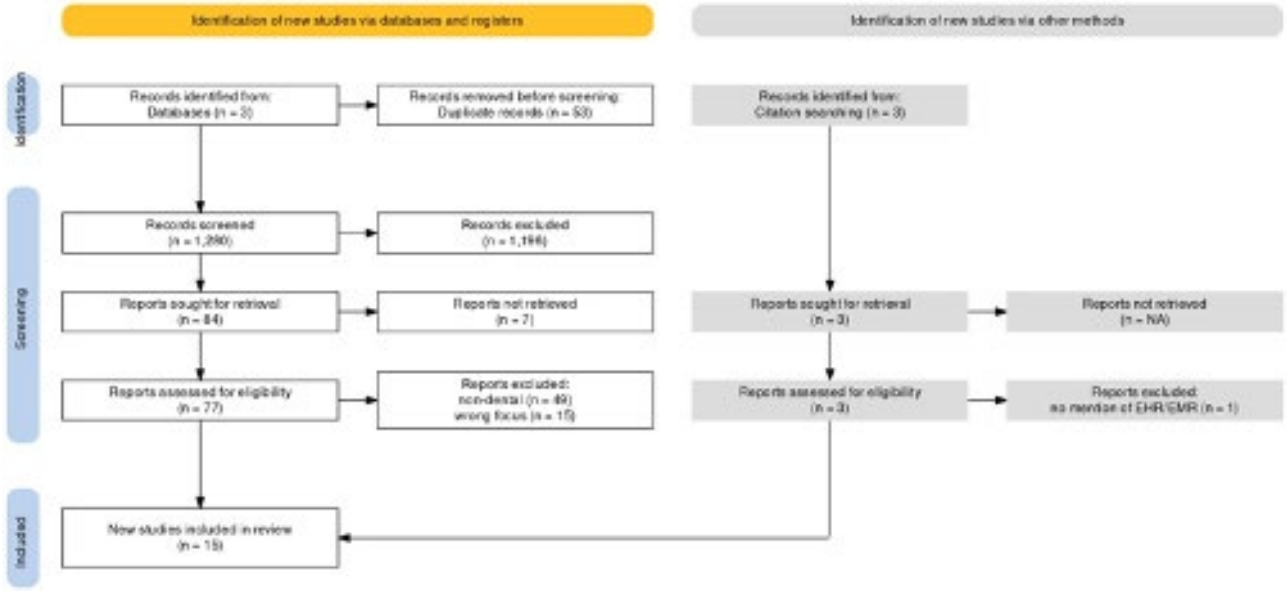
APPENDICES

Appendix 1: PRISMA flow diagram



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FDI World Dental Federation
Chemin de Joinville 26 • 1216 Geneva • Switzerland
T +41 22 560 81 50 • info@fdiworlddental.org

Editorial and writing support:
Dr Charanjit Jagait, FDI Public Health, Advocacy and Communications Director
Dr Rachael England, Public Health Manager

fdiworlddental.org

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