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What is dental health informatics?

A peer-reviewed course written by Staci Violante, MSDH, RDH

PUBLICATION DATE:	SEPTEMBER 2019
EXPIRATION DATE:	AUGUST 2022

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What is dental health informatics?

Abstract

Dental health informatics is the "application of computer and information science to improve dental practice, research, education, and management, and it is a subdiscipline of biomedical informatics. Numerous applications that support clinical care, education and research have been developed."[1] Dental informatics is "centered on harnessing technology to obtain clinical information that can be used to improve patient care or support treatment plans."[2]

The field of dental informatics is concerned with the interchange of health informatics and dentistry exclusively. Dental informatics is thriving, and the interest within the profession is continuously growing, both academically and among practicing dentists and hygienists. Further, dental schools and dental practices are implementing electronic health records (EHR) systems, and health information exchanges (HIE) are transfiguring the way health-care providers are communicating and practicing interprofessionally. The demands of federal and state programs to promote EHR adoption among certain health-care providers are also beginning to affect dentists across the country. As a result of these changes, dentistry is engaging information technology to meet its clinical, administrative, research, and educational needs more than ever.

Learning objectives

At the conclusion of this educational activity, participants will be able to:

- Identify dental health informatics
- Appreciate the importance of dental health informatics in dental education
- Understand the benefits of dental health informatics
- Identify the challenges of dental health informatics

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Introduction

Dental informatics is a new innovative field that has completely changed how we practice health care today. It supports not only medicine and dentistry, but research, education, clinical care, and practice management. Informatics utilizes computer science and software IT programs to manage, interpret, and communicate data for optimal patient care and its utilization in dentistry. Still, there are underserved and developing countries that are unfamiliar with dental informatics and all its capabilities.

Despite its advancements, there are also some technical issues that come with any computer programs, such as security issues of patient information over the internet. The purpose of this course is to give an overview of dental informatics, its functions, utilizations, advantages, and disadvantages as well as suggestions for improvements in this field.

Dental informatics is beginning to exhibit the characteristics of a discipline, including core literature, trained specialists, and educational programs. Digital imaging and processing, electronic dental records, clinical tech online support, and teledentistry are some examples of research topics in dental informatics. The discipline is what some would consider a "young scientific discipline"[3] that is growing rapidly and appearing in private practices and schools all over the country. "Many confuse informatics with information technology (IT),"[4] unaware of its methods and principles and cannot relate dental informatics to the biomedical informatics discipline.

"Information technology now holds the potential to revolutionize healthcare through more rapid and efficient management of an ever-increasing quantity of clinical information."[5]

Statement of the problem

The adoption of dental health informatics is on the rise and continues to grow due to EHR and the Affordable Care Act (ACA) changing the way providers treat patients and communicate interprofessionally. Electronic health records include medications, complete health history and patient history, radiographs, and treatment history all in real time, so any given provider who has access and commonly shares the patient can login, view the patient records, edit, and send off to a referred doctor. This has and is transforming medical and dental care and is supporting dentistry's role within the health-care system.

Goals of dental informatics

- Improved patient outcomes
- More competent delivery of dental care
- Evidence-based solutions to clinical problems
- Continued competency among practitioners and researchers

Electronic health records

An electronic health record is "often defined as a complete longitudinal history of an individual's health care across all settings and encounters as well as the data types and relationships that would enable it to be created, stored, and managed electronically."[9] There are many different software programs to meet various needs, ranging from large hospital facilities to small private practices. Each one is different and may be custom programmed to suit the needs of the purchaser. There are display formats for chart layouts, patient histories, consents, prescription managements with referrals, radiographs, and specialty forms.

These EHR or dental health records can be shared throughout the multidisciplinary dental team and are inclusive of a broader view of a patient's care. The records include an assortment of data such as: medical history, patient demographics, medications, allergies, lab tests and results, radiographs, vital signs, BMI, personal information, and billing information. These systems store data accurately and precisely and eliminate the need to sort through paper records, and they are legible and in order.

There are many pros and cons to EHR due to its internet base. There is a privacy concern if it falls into the wrong hands. But their cost effectiveness, organization, reduced patient risks, and use in research outweigh the concerns.

Advantages of electronic health records

EHRs may eventually help improve care coordination. An article in the International Journal of Advanced Research in Science, Engineering and Technology states that "since anyone using an EHR can view the patient's full chart, it cuts down on guessing histories, seeing multiple specialists, smooths transitions between care settings, and may allow better care in emergency situations."[6] EHR provide doctors and patients improved access to test results, which are available immediately. They also provide improved accessibility to patients' data, alerts on duplicate charts and missing information, and offer evidence-based recommendations for preventive services. The data can be used to examine and identify trends in a patient. Some advantages include: cost savings, time savings, safer and higher quality care, and privacy. The elimination of paper charts, missing pages, and having to thumb through unorganized pages not only saves time but may prevent errors related to illegible, missing, or incorrect notes.

These systems will not only provide alerts for medications if a patient is allergic or was already prescribed, but they will also provide early identification and care. For example, patients with prediabetes and diabetes often go undiagnosed for many years. "Early identification and care can lead to improved glycemic outcomes and prevent wide-ranging morbidity, including adverse oral health consequences, in affected individuals. Information available in the dental office can be used by clinicians to identify those who remain undiagnosed or are at risk; the accuracy of this prediction increases when combined with information from the medical electronic health record."[7]

Still pending is the opportunity "to develop a nationwide oral health database that contains basic patient-level diagnostic, treatment, and outcome data linked to a nationwide medical database. Such a resource would allow dentists to identify relationships between dental diseases or conditions and medical diseases, conditions or medications." This will directly link dentistry to medicine and encourage interdisciplinary collaboration between physicians and dentists.[8]

Still, some doctors are reluctant to utilize electronic medical and dental records to prescribe medications, which can eliminate duplicate records and reduce errors in prescribing medications and/or prescribing incorrect medications.

Disadvantages of electronic health records

With every advantage, there are also disadvantages. With growing implementation of EHR and adoption of dental informatics, there can be many roadblocks, and the process can be quite convoluted. One of the fundamental disadvantages to electronic health records is that start-up costs are vast. Aside from buying the equipment and software to record and store patient charts, staff must convert all paper charts into electronic form. Additionally, there is the expense of paying staff and trainers for training on the EHR software.

Patients' personal, dental, and medical information is stored in these systems. If not properly protected, anyone may access it. Patients' privacy must be protected and considered when implementing internet based systems. Standardization may be an issue if a patient's record is transferred to another facility or if the language is different and not understood, and most importantly, if the system is down and patient information is unavailable. This may not only be inconvenient; it may also be life threatening. Support is costly but a necessity for these systems.

Information hacking seems to be the biggest challenge with EHR, patient portals, or any online portal that includes personal information such as medical/dental records, online billing, or online credit information utilizing banking or payment information. The risk of theft is an ongoing challenge. Most companies ensure protection and educate on how to protect information from being hacked. Constantly changing passwords, using encrypted passwords that are hard to enable, and constantly watching and checking any online billing minimize risk.

Challenges facing dental informatics

Some challenges facing dental informatics include:[1]

- Universal patient identifier
- Secure user authentication
- Universal access to computers and high-speed internet connections
- National list of authorized dental practitioners
- Collections of large databases of patient information
- Professional under-representation
- Lack of literature on dental informatics
- Academia unfamiliarity due to noninclusion in dental research community[1]

Protecting patients' dental records

Protection of the data that is being inputted and stored can be challenging. Companies must set up safe, viable security systems before the network is hacked. This involves identifying the security dangers and risks, applying sufficient means of security, and training the users' data security recognition.

Once all of the patient's information is entered, updated, and charted, how can we protect it? Who has the right to access it? Is it encrypted? Who can make changes? Decrypting records is made available only to users who have access to do so. The PIN and/or password should use not only letters but also numbers and/or a special key and should be encrypted (translated into a secret code) to make hacking more difficult. A patient's record—medical and dental—can be changed only by the dentist or treating physician, but a patient may add information. "This is to ensure accuracy of information and not allowing a patient to possibly change or hide important information that may be crucial to treatment."[9] Even though a patient may be treated by a multidisciplinary team, only the treating doctors may have access unless authorized. To preserve the patient's privacy and security, safeguards must be put in place.

The use of informatics in dental education

Many dental health providers are unaware of dental informatics and all it has to offer; however, dental schools have already incorporated dental informatics, teaching new doctors its potential and usage to take into their future practices.

Over the past several years, dental schools have made considerable advancements in increasing student access to technology-based learning formats. "Students can access technology-based resources at the college from their homes or dorms, and many seminars and lectures are given using laptop computers."[10]

With computer advancement and accelerated development of computer information technology (IT), present-day dental research has become more reliant on informatics, which can provide considerable support to clinical care. Dental schools today are considering innovative applications to incorporate informatics into dental education.

These technologies include "practice management programs, oral health records programs, intraoral technology, multimedia patient education, differential diagnosis and treatment programs, digital radiography, air abrasion, lasers, imaging, computer-assisted design and manufacturing (CAD/CAM) devices, computer-assisted anesthetic delivery systems, and electronic probes."[10] Integrating informatics into dental education prepares students for the use of this technology in private practice and research, as technology is a significant element in dentists' armamentarium.

"In 2007, fourteen dental schools formed the Consortium for Oral Health-Related Informatics (COHRI). Since its inception, COHRI has established structural and operational processes, governance and bylaws, and a number of work groups organized in two divisions: one focused on research (data standardization, integration, and analysis), and one focused on education (performance evaluations, virtual standardized patients, and objective structured clinical examinations)."[12]

Dental schools have been successful in testing data and sharing EHR enhancements, promoting the utilization of informatics in dental education, and laying the groundwork for evidence-based dentistry.

Intranet and internet

Merriam-Webster defines the intranet as "a network operating like the World Wide Web but having access restricted to a limited group of authorized users (such as employees of a company)."[14]

An important asset and strength of the intranet is the capability to link to areas within the college or university's intranet or internet. Integrating sciences and clinical sciences to provide clinically pertinent experiences allows students to form linkages between disciplines and to utilize the information in their real-time appointments in managing patients clinically. "The

intranet becomes an ideal vehicle to link together relevant material, thereby facilitating the integration. As the intranet continues to grow, so too will the connections between courses."[10]

Specifically, you may find lecture outlines, course syllabi, assignments, handouts, videos, quizzes and exams, important announcements, lecture slides, student information, project information, faculty information, and important useful links. The web is currently used by faculty and students as a reference and guide for the recovery of information. It allows for collaboration between courses as well as schools if case/patient information is essential for review. Aside from the internet and intranet, academia is utilizing software programs for selective lectures and assessment.

The future of dental informatics

It is predictable that informatics in the dental office will continue to grow beyond traditional practice management and clinical applications. Informatics will play a role in communication between dentists and their patients. Some dentists are already using the internet for communication with colleagues and patients via e-mail and the World Wide Web as well as online chats and teleconferencing. Dental education and continuing dental education will see an increase in the number of online courses offered. As more and more technology is incorporated into the dental office, dental education will have to keep pace by introducing informatics courses addressing this new technology. Dental education will see the use of computer-based learning in the curriculum grow at the same rate as the growth of information technology in all other parts of our lives.

As of today, there are many new tools that informatics has provided for dental educators, providers, and researchers. Such tools include a new method of screening for precancerous and cancerous lesions and a "computerized data acquisition to identifying which function specific genes have."[13] The continuous growing trend of computer-based records, teledentistry, distance learning, and computer-based support "offers a fertile field for research and teaching."[11] Faculty in dental informatics have a significant diversified function and will innovate and impact the development of this current field for years to come.

Conclusion

Technology will allow for "a better level of care with greater efficiency and productivity."[9] Patients also will benefit from these technological advances. Appointments will be easier and more efficient; multidisciplinary communication with other treating physicians will eliminate discrepancies and medication errors; missing chart information and pages will be eliminated; and charts will be easier to read and pan through.

"Systematic understanding of the goals, technique, methods, and implementing strategy of informatics, individuals, and communities working in applied areas of science will be able to identify effortlessly how informatics could potentially be a useful tool in their own work."[1]

Dental informatics "may bring a wide range of applications and tools for clinical practice in terms of diagnosis of oral diseases, prescription, indications and contraindications of certain drugs in patients with specific conditions and many more."[1] It is almost impossible today to practice dentistry and medicine without the aid of technology to run a successful clinic, school, hospital, or practice. Informatics utilizes computer software to enhance dental education, research, and administration.

Electronic health records and informatics have transformed the health-care field and changed the scope of dentistry. The future of dentistry relies on computer-savvy and computer-literate practitioners.

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QUESTIONS

1. The field of dental informatics is concerned with:
   - A. The interchange of health informatics and medicine exclusively
   - B. The interchange of medicine and dentistry exclusively
   - C. The interchange of health informatics and dentistry exclusively
   - D. None of the above

2. Dental health informatics is:
   - A. The application of computer and information science to improve dental practice, research, education, and management, and it is a subdiscipline of biomedical informatics
   - B. The application of computer and information science to improve medical practice, research, education, and management, and it is a subdiscipline of biomedical informatics
   - C. Improved technology
   - D. None of the above

3. An example of research topics in dental informatics is:
   - A. Digital imaging and processing
   - B. Electronic dental records
   - C. Teledentistry
   - D. All of the above

4. Dental health informatics is on the rise and continues to grow due to EHR and the:
   - A. ADA
   - B. ACA
   - C. ADEA
   - D. ADHA

5. Electronic health records include:
   - A. Medications
   - B. Complete health histories
   - C. Radiographs
   - D. All of the above

6. What is the main challenge of EHR?
   - A. Difficulty
   - B. Effectiveness
   - C. Privacy
   - D. Ease

7. Which is an advantage of EHR?
   - A. Improved care coordination
   - B. Better care in emergencies
   - C. Cuts down on seeing multiple specialists
   - D. All of the above

8. Which statement is true of EHR?
   - A. They provide doctors and patients improved and immediate access to test results
   - B. They alert on duplicate charts and missing information
   - C. There is no immediate access
   - D. A and B

9. A disadvantage of EHR is:
   - A. Expense
   - B. Possible breach of privacy
   - C. If the system is down, information is unavailable
   - D. All of the above

10. The best way to protect patient records is by:
    - A. Using an encrypted code, PIN, or password
    - B. Not using a password
    - C. Sharing the password
    - D. None of the above

11. All may add to a patient's record except:
    - A. Family member
    - B. Dentist
    - C. Treating physician
    - D. Patient

12. Which of the following are goals of dental informatics?
    - A. More competent delivery of dental care
    - B. Continued competency among practitioners and researchers
    - C. Improved patient outcomes
    - D. All of the above

13. Challenges facing dental informatics include:
    - A. Universal patient identifier
    - B. Universal access to computers and high-speed internet connections
    - C. Academia unfamiliarity due to noninclusion in dental research community
    - D. All of the above

14. Which of the following is the most challenging for dental informatics?
    - A. Patient portals
    - B. Hacking
    - C. Patient payment
    - D. None of the above

15. An important asset and strength of the intranet is:
    - A. Fast connection
    - B. Slow connection
    - C. The capability to link to areas within the college or university's intranet or internet
    - D. None of the above

16. Decrypting records is made available:
    - A. Only to users who have access to do so
    - B. To all
    - C. To family
    - D. To doctors

17. Encrypted code is:
    - A. Translation of data into a secret code
    - B. PINs and passwords with numbers and letters
    - C. PINs and passwords with letters and special keys
    - D. PINs and passwords with numbers, letters, and special keys

18. A patient may only ___ information to their patient record.
    - A. Add and change
    - B. Change
    - C. Add
    - D. Review

19. What information is stored in the system that needs protection?
    - A. Patient's medical information
    - B. Patient's dental information
    - C. Patient's personal information
    - D. All of the above

20. Standardization may be an issue if:
    - A. A patient's record is transferred to another facility
    - B. The language is different and not understood
    - C. The system is down
    - D. All of the above

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QUESTIONS

21. What is a necessity for systems that store information?
    A. Support
    B. Update
    C. Money
    D. None of the above

22. EHR may:
    A. Eventually be extinct
    B. Eventually help improve care coordination
    C. Not help at all
    D. None of the above

23. Dental informatics has the potential for supporting:
    A. Clinical care, research, education, and management
    B. Research only
    C. Education and management only
    D. None of the above

24. What are some conflicts of dental informatics?
    A. Professional under-representation
    B. Security issues of the stored information
    C. A and B
    D. None of the above

25. A system to prevent hacking involves:
    A. Identifying the security dangers and risks
    B. Applying sufficient means of security
    C. Training the users' data security recognition
    D. All of the above

26. The adoption of dental health informatics is on the rise and continues to grow due to EHR and the ACA by:
    A. Noncommunication
    B. Changing the way providers treat patients and communicate interprofessionally
    C. Practice alone
    D. None of the above

27. Electronic health records are:
    A. All in real time
    B. In nonreal time
    C. Delayed
    D. None of the above

28. Dental health informatics is a subdiscipline of:
    A. Medical informatics
    B. Biomedical informatics
    C. Personal informatics
    D. Computer informatics

29. Who is implementing electronic health records systems?
    A. Practicing dentists and hygienists
    B. Dental schools and dental practices
    C. Dental practices
    D. All of the above

30. The demands of _____ to promote EHR adoption among health-care providers are also beginning to affect dentists across the country.
    A. Federal and state programs
    B. Professional associations
    C. Patients
    D. Grant programs

Notes

PUBLICATION DATE:	SEPTEMBER 2019
EXPIRATION DATE:	AUGUST 2022

ANSWER SHEET

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1. Identify dental health informatics
2. Appreciate the importance of dental health informatics in dental education
3. Understand the benefits of dental health informatics
4. Identify the challenges of dental health informatics

Course Evaluation

1. Were the individual course objectives met?

Objective #1: Yes No Objective #3: Yes No Objective #5: Yes No Objective #7: Yes No

Objective #2: Yes No Objective #4: Yes No Objective #6: Yes No

Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.

2. To what extent were the course objectives accomplished overall? 5 4 3 2 1 0
3. Please rate your personal mastery of the course objectives. 5 4 3 2 1 0
4. How would you rate the objectives and educational methods? 5 4 3 2 1 0
5. How do you rate the author's grasp of the topic? 5 4 3 2 1 0
6. Please rate the instructor's effectiveness. 5 4 3 2 1 0
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8. Please rate the usefulness and clinical applicability of this course. 5 4 3 2 1 0
9. Please rate the usefulness of the supplemental webliography. 5 4 3 2 1 0
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_____

13. Was there any subject matter you found confusing? Please describe.

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14. How long did it take you to complete this course?

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_____

_____

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2.	Ⓐ	Ⓑ	Ⓒ	Ⓓ		17.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
3.	Ⓐ	Ⓑ	Ⓒ	Ⓓ		18.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
4.	Ⓐ	Ⓑ	Ⓒ	Ⓓ		19.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
5.	Ⓐ	Ⓑ	Ⓒ	Ⓓ		20.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
6.	Ⓐ	Ⓑ	Ⓒ	Ⓓ		21.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
7.	Ⓐ	Ⓑ	Ⓒ	Ⓓ		22.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
8.	Ⓐ	Ⓑ	Ⓒ	Ⓓ		23.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
9.	Ⓐ	Ⓑ	Ⓒ	Ⓓ		24.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
10.	Ⓐ	Ⓑ	Ⓒ	Ⓓ		25.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
11.	Ⓐ	Ⓑ	Ⓒ	Ⓓ		26.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
12.	Ⓐ	Ⓑ	Ⓒ	Ⓓ		27.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
13.	Ⓐ	Ⓑ	Ⓒ	Ⓓ		28.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
14.	Ⓐ	Ⓑ	Ⓒ	Ⓓ		29.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
15.	Ⓐ	Ⓑ	Ⓒ	Ⓓ		30.	Ⓐ	Ⓑ	Ⓒ	Ⓓ

AGD Code 730

PLEASE PHOTOCOPY ANSWER SHEET FOR ADDITIONAL PARTICIPANTS.

INSTRUCTIONS
All questions have only one answer. Grading of this examination is done manually. Participants will receive confirmation of passing by receipt of a verification form. Verification of Participation forms will be mailed within two weeks after taking an examination.

COURSE EVALUATION AND FEEDBACK
We encourage participant feedback. Complete the survey above and e-mail feedback to Aileen Gunter (agunter@endeavorb2b.com) and Laura Winfield (lwinfield@endeavorb2b.com).

COURSE CREDITS AND COST
All participants scoring at least 70% on the examination will receive a verification form for three CE credits. The formal CE program of this sponsor is accepted by the AGD for fellowship and mastership credit. Please contact Endeavor for current term of acceptance. Participants are urged to contact their state dental boards for continuing education requirements. Endeavor is a California CE provider. The California provider number is 4527. The cost for courses ranges from $20 to $110.

PROVIDER INFORMATION
Endeavor Business Media is an ADA CERP—recognized Provider. ADA CERP is a service of the American Dental Association to assist dental professionals in identifying quality providers of continuing dental education. ADA CERP neither approves nor endorses individual courses or instructors, nor does it imply acceptance of credit hours by boards of dentistry. Concerns about a CE provider may be directed to the provider or to ADA CERP at ada.org/gotocerp/.

Endeavor is designated as an approved PACE program provider by the Academy of General Dentistry. The formal continuing dental education programs of this program provider are accepted by the AGD for fellowship, mastership, and membership maintenance credit. Approval does not imply acceptance by a state or provincial board of dentistry or AGD endorsement. The current term of approval extends from 11/1/2015 to 10/31/2019. Provider ID# 320452.

RECORD KEEPING
Endeavor maintains records of your successful completion of any exam for a minimum of six years. Please contact our offices for a copy of your CE credits report. This report, which will list all credits earned to date, will be generated and mailed to you within five business days of receipt.

EDUCATIONAL DISCLAIMER
Completing a single CE course should not provide enough information to give participants the feeling that they are experts in the field related to the course topic. It is a combination of many educational courses and clinical experience that allows the participant to develop skills and expertise.

CANCELLATION AND REFUND POLICY
Any participant who is not 100% satisfied with this course can request a full refund by contacting Endeavor in writing.

IMAGE AUTHENTICITY
The images provided and included in this course have not been altered.

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