

REVIEW ARTICLE

ROLE OF BIOMEDICAL INFORMATICS IN DENTISTRY

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ABSTRACT:

Biomedical informatics is a medical practice that is applied in dentistry to enhance operations. Dentistry is a complex medical field that requires utmost precision and care for purposes of delivering quality services to patients. As such, the use of biomedical informatics enables doctors to make perfect decisions regarding the modes of treatment able to solve patient's complications. Dentistry is one such field that relies on this mode of scientific intervention for purposes of improving and taking care of patient's dental health. Most of the operations undertaken by biomedical informatics deal with complicated issues that cannot be easily handled using the formal methods of data collection. Operations in biomedical involve handling cases that require meaning, hence making the meaning identification more difficult. The use of computerized methods of information is not a new aspect in the medical idea. Computers and other technological materials have been introduced to generate and enhance good ideas by medical practitioners. The biggest agenda is to ascertain that people's dental health is maintained. Different medical spheres have used biomedical informatics with dentistry being among the leading medical practices. This practice relies on technology as so; computerized operations are a common factor in the dentistry field. This implies that a high technology is applied in dental informatics for purposes of providing healthcare officials with all relevant information regarding a certain ailment. Dental informatics creates a healthy and fast relationship between a doctor and the patients being administered. This is done by increasing the ease with which these doctors' access patient related information from the technological devices. It facilitates the development of wise decisions that have the capability of helping the patients towards health recovery. Dental informatics creates a forum where doctors can collectively analyze patient data and come up with the most appropriate decisions. This creates an environment where integrity and responsiveness is increased to benefit the patients.

Key words: Electronic data storage, simulation, computational methods, restorative dentistry, virtual learning.

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INTRODUCTION

Biomedical informatics uses information optimally comprising of the assistance of both people and technology. This combination is applied for purposes of improving different areas of medical health. These include public health, personal health, healthcare and biomedical research. This practice offers a system where medical personnel undertake basic and broadly applied biomedical informatics. The immediate result is a case where they acquire innovations and basic scientific concepts in

healthcare. Biomedical informatics is a complex field that requires utmost precision and understanding, where it also involves the use of technologically sourced and displayed data, to make ideas about medical issues (Reynolds, Harper and Dunne, 2008).

Dentistry was the first medical section to use computers in analyzing medical data and procedures. In the dentistry world, this method is also referred to as dental informatics. Medical informatics was introduced later while dental informatics was operational a long time ago. Despite

the early introduction, dental informatics became known by the whole world in 1986. The introduction of dental informatics can be said to be one that was delayed although it later gained tremendous operational improvements. The delayed growth and introduction can be associated with issues such as economic and medical policies. Patients have been able to benefit from better patient management programs together with a reliable healthcare administration plans.

Dentists are medical practitioners who have witnessed the slow growth associated with dental informatics. Many medical schools currently rely on biomedical informatics to learn important materials that are necessary in their operations. Traditional methods of learning such as the use of paper and pen are now diminishing as the system is completely changing. Dental informatics allows dentists to handle, analyze and get better results regarding various complicated issues in their field. This is a field that is complex and quite necessary for the wellbeing of individuals. This system allows the medical officers to exchange information for purposes of integrating and improving medical operations. It aids in developing wise and productive decisions that reduce the occurrence of mistakes that could affect the wellbeing of the patients being attended. Biomedical informatics is also responsible for improving the state of technological equipment in dental facilities. As such, its introduction has been of great value in the development of dental, medical operations. Biomedical informatics has various roles in the dentistry field which are essential for service delivery.

ENHANCING DENTAL OPERATIONS

Dental informatics creates a system of efficiency and innovativeness in the medical field for purposes of delivering good results. The access and overreliance on technological information allows dentists to improve and support the welfare of their patients. The patients are also not left behind as they experience high quality medical care standards. Dental informatics facilitates the creation of theoretical methods that are required for Implementing and introducing new systems, ideas and approaches. A model for dental healthcare involves issues such as symptoms of the disease and how to effectively control it. The use of a theoretical model as facilitated by dental informatics happens to be of high value to not only the patients, but also the

doctors. Diagnostic operations on patients are undertaken in a fast move that shortens the period of medical administration. It also supports the administration of right and accurate medical procedures to help the patient in their journey towards recovery. Biomedical informatics in dentistry ensures that dentists can effectively analyze data to test different techniques that are applicable in treating some diseases (Reynolds, Harper and Dunne, 2008).

Many dental practitioners are currently relying on electronic material to maintain details regarding patient's medical operations. This ensures that medical operations are administered efficiently for the purposes of improving the integrity of the medical systems. A direct access to a quality system and operational procedures assures one of quality services in the healthcare field. Dentists have successfully relied on this method to create a healthy operational structure in dealing with dentistry operations. Keeping a good track of client details and administered medical procedures facilitates decision making. Dental informatics have numerous and uncountable benefits to the dentistry health field based on the opportunities it brings forth.

FACILITATES USE OF RIGHT EQUIPMENT AND PROCEDURES

It facilitates the implementation of useful systems that monitor operations to ensure that medical operations are correctly administered. The applied technological systems are easy to use, thus help health officials in the administration of their services. Dental informatics makes it easy to use some technological interventions that may be complicated or too difficult to translate. Biomedical informatics evaluates all systems to monitor whether they pose any efficiency in dentistry or not. All systems ought to facilitate an improvement in the delivery of services to help improve the patient's welfare. There are numerous reasons that lead to the improvement of the dental operations. An effective use of dental informatics leads to increased efficiency in operations and reducing operational costs. The system is thus essential in offering patients with high quality and affordable medical health services. The availability of the necessary infrastructure promotes integrity and responsiveness in healthcare.

Dental informatics is a field that is quite young, but portrays numerous strengths in the administration of

medical services. The presence of dental informatics in healthcare facilitates the use of scientific operational methods. This creates a platform where quality and improved services are offered for the benefit of all the parties involved. Doctors get the ability to perform easy operations while patient's health complications are well handled. If well applied in operations, the dental department will face tremendous improvements regarding medical operations. This has been made possible by the positive potential held by the current system. In order to deliver quality services, all dental firms ought to accommodate high technology for purposes of directly accessing dental informatics.

ENHANCES MEDICAL RESEARCH

Biomedical informatics facilitates research operations in healthcare to help medical officials to devise better and effective operational procedures. Dental informatics promotes the formulation of appropriate models together with the development of important medical theories. These operations are undertaken to develop better operational methods that are most likely to improve operations in the industry. Every medical field aims at accommodating and practicing all the emerging strategic practices that are positive and able to yield positive results (Reynolds, Harper and Dunne, 2008). Undertaking operations in dentistry require a direct access to dental informatics. This system provides dentists with all the relevant information, hence determining the most effective treatment method. Diagnosing diseases in dentistry require accessing information such as restorations, pocket depths, carious lesions, mucosal and gingival status.

After the signs and symptoms are identified, dental informatics facilitates their combination with the knowledge held by dentists. Computers are quite necessary at this point because they provide options that can be applied to solve the problems being experienced by the patient. Bayesian and Neutral networks can also be applied to model the disease treatment and program procedure. After developing the models successfully, the next operation includes developing a computing system. The computing system allows the implementation of the model thus allowing end users to apply it. These are operations which, if not operated technologically could prove to be difficult and pose challenges to the whole industry. The presence and use of biomedical informatics allow dentists to carry out complex operations for the integrity of their services. Research has been undertaken by the BIRC on dental informatics to completely solve all the medical needs experienced in the dental field. Education and research are practices that are highly regarded to enlighten dentists on how to effectively perform their duties. Dental informatics addresses the medical firms or people that don't regard the mouth as a human body component. It thus acts as a direct link between systematic and oral health. In a few years to come, harmonization will be achieved between both dental and medical healthcare. This will facilitate the creation of a reliable healthcare system that values the needs of its clients. During the evaluation of the system, informaticians conduct an evaluation of the implemented systems to be certain of their efficiency. The evaluation is done with a high consideration projected to the patient's health to ensure that only positive results are achievable.

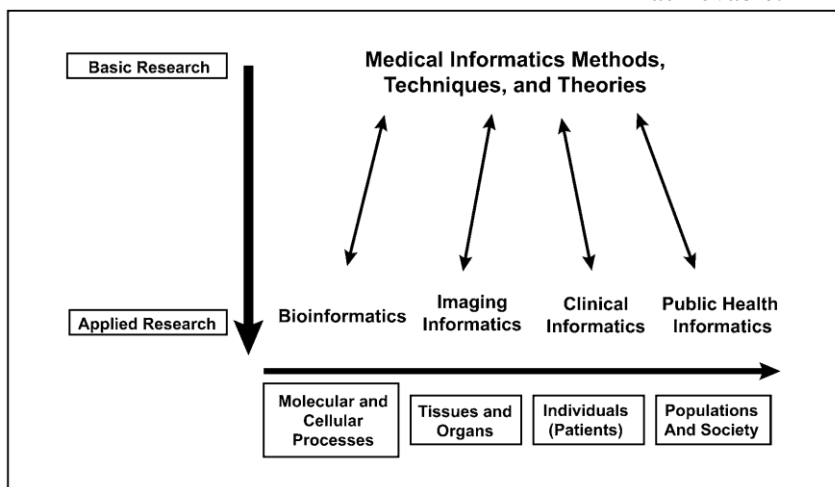


Figure 1: Relationship of basic research in biomedical informatics to the spectrum of applications in biomedicine. Source: Shortliffe E, Johnson S (2002). Medical informatics training and research at Columbia University. Yearbook of Medical Informatics, pp. 173-180. Reprinted with permission from Schattauer Verlag, Stuttgart, Germany.

There exists a small contrast between informatics and information technology. Many are the times people confuse both fields due to the poor knowledge entailed in each unit. Informatics can be termed as a research procedure applied with the aim of developing principles that are linked to computers and information. Information technology in itself stands for applying and implementing and offering technological support to medical operations. Research questions direct the operations of informaticians for purposes of solving the medical problems facing their clients. The research questions studied in dental informatics are quite complex and thus require better handling methods. To beat these differences, informatics seeks assistance from scientific fields by borrowing research methods.

ENABLES DENTISTS TO MAKE WISE DECISIONS

Biomedical informatics as a general field is well applied in dentistry and it guides the content and operations of dental informatics. It divides into health subsection such as nursing informatics, dental and pathology informatics. Biomedical informatics offers the best possible solutions that can solve different dentistry operational problems. The benefits of biomedical informatics are experienced by practitioners, educators and researchers. Biomedical informatics in dentistry facilitated the use of electronic dental records that keep important data regarding a client's diagnosis and treatment. This aspect serves the purpose of improving quality and the application of wise decisions in dealing with patient's oral health. It also helps in developing accurate evidence regarding patient care together with knowledge generation.

ELECTRONIC DATA STORAGE

The generated knowledge enables dentists to understand all terms and processes applied in dentistry to support the wellbeing of their clients. Biomedical informatics can support the development of electronic data storage mechanisms to improve the performance of healthcare operations. The development of electronic records will make it easy to promote the cognitive duties of dentists. It will also pose positive results to other involved parties such as patients together with their families. The use of informatics in dental healthcare provides patients with accurate screening techniques. Patients subjected to both dental and clinical care confess of differences in the mode of

assessment and treatment. This is because dentistry uses these improved operations because of using high quality information and processes. The case is quite different for the other health segments as they have not fully accommodated biomedical informatics.

A perfect combination of both computer applications and information science provides dentists with all the knowledge they need. Having applied this practice, the evolution of dental informatics can be of great importance to the health sector. Enlightenment has been achieved thus making the dental field a profitable venture to the oral care sector. The use of biomedical informatics in dental healthcare creates a big difference between dentistry and other healthcare procedures. The operations undertaken by dentists are easily performed because they have the ability to analyze data extensively. This ability enables them to offer only the most appropriate methods that are necessary for dental problems. Although the use of computers and evaluation methods are difficult, dentists have managed to offer high quality services. This performance has been supported by the availability of necessary materials and the will to learn and undertake new operations.

COMPUTER SCIENCE AND TELECOMMUNICATIONS

Dental informatics has introduced several other fields in the dental field. These include telecommunications and computer science, methods which are essential in keeping a good track of events related to patient treatment. Dental informatics allows the conceptualization of computerized methods to create a good historical data regarding a patient's treatment. Dental informatics has solved the information intensive needs of dentistry thus facilitating conducting of successful oral healthcare procedures as well as ground-breaking research. Biomedical informatics have supported the implementation of new and strategic regulations, accountability, and risk management. The goals of dental informatics are aimed at improving customer outcomes, which arrived at, by applying standards operational procedures. Thousands of dentists have managed to deliver efficient oral care operations because of their acquisition of relevant data. This has been achieved by capitalizing on cost benefit ratios to offer affordable and high quality treatment services. The use of dental informatics of dentists

has equipped them with important information that is applicable in improving the efficiency of service delivery. These applications include dental hygiene, record keeping, Dental education, computer video imaging, and digital radiography. These are also accompanied by research, tele-dentistry and computer aided manufacturing.

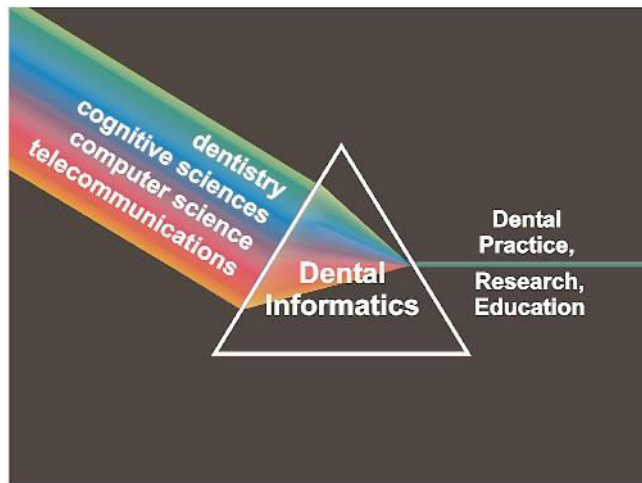


Figure 2: Source:T.K. Schleyer. Dental Informatics: An Emerging Biomedical Informatics Discipline, Adv Dent Res 17:4-8, Dec.2003)

SIMULATION

Informatics in dentistry provides learning methods that equip students and doctors with better knowledge on dental hygiene and medical care. Computer learning packages have been developed to provide all the necessary information that is useful in dental operations. The disciplines that expound on include tooth anatomy, oral pathology, general teaching and trauma. This information is availed to provide all the necessary information regarding dental complications. The information is important as it enables students to solve problems by applying critical thinking criteria and making wise decisions. This benefit goes to not only the dental students, but also the performing dental officers. The wide scope of information provided makes it easy for patients to be administered with highly generated procedures. Success is caused by the availability and use of dental information and materials which are easily accessed. Dental hygiene also relies largely on simulation, which can only be obtained from dental informatics. Biomedical informatics help improve the mode with which dentists are taught to for them to handle tasks accordingly. The advantage of informatics is that it makes it easy and fast for

doctors to achieve the competency levels required in their field. Reading and annotation are also possible because dental informatics provides E-textbooks. This facilitates understanding and an easy application of the acquired knowledge with after using information technology to analyze the data. Dental education is perfected by informatics because data can be easily accessible by use of high quality transmission materials.

ENABLES DATA ANALYSIS

Dental informatics creates a platform where a client's data can be well stored, and analyzed to devise the suitable mode of treatment. It also enables dentists to identify the progress of the treatment to note what other methods are applicable. The use of electronic records determines which resources can easily be used to administer treatment to an already affected patient. Every dental condition has methods and tools that are used to attend to it. This is facilitated by informatics which is missing, could paralyze the operations of the dental field. The dental records of patients comprise of various issues that are necessary for efficiency and integrity to be attained in dental care. All these are enjoyed and applied because of the existence and the ability to use dental informatics. These include issues like dental history, treatment planning, patient care database and medical alerts. Other issues are also accommodated in the system and these include dental care guidelines, diagnostic decisions and care modifiers. The electronic record contents provided by dental informatics are also of great importance to the patients. They manage to keep track of the medical procedures that have been subjected to them (Titus, 2009).

COMPUTATIONAL METHODS

Biomedical informatics support dental health, thus eliminating all traditional methods of analyzing medical data. The use of computations becomes easy and fast, thus enabling dentists to use their critical thinking abilities to serve their patients appropriately. The effective use of dental informatics has helped the dental sector to perform better than other sectors in the health field. The performance is quite high because all the necessary materials are available to dentists thus enabling them to deliver good results. The benefits enjoyed from the presence of a reliable electronic system include the improvement of dental service delivery. It also supports the development of wise decisions

and development of systemic medical practices. Future developments will create a system where patients and doctors will be addressed to preventive mechanisms to avoid suffering from major dental complications.

RESTORATIVE DENTISTRY

Biomedical informatics provides dentists with computer developed designs which function in restorative dental operations. This technology equips dentists with the required knowledge regarding operations such as tooth filling that are colored. The dental laboratory thus relies on the CAD technology to enhance the restoration of teeth for the benefit of the patients. It's a practice that acts as one of the possible treatment procedures among the many ideas developed by dental informatics. This implies that dentists rely on informatics to derive best treatment and operational methods together with resources. Different diagnostics portray different symptoms and thus require different treatment methods. Biomedical informatics accurately provides dentists with all the required information.

ENHANCES PERFECTION IN DENTISTRY

The use of dental informatics eliminates cases of unnecessary errors that may affect the wellbeing of patients. Just like other types of treatment, dental healthcare requires utmost precision and competency. This department has already stabilized because it was established in the industry a long time ago. This stands as the main factor why dentistry is quite differentiated from the other medical practices. The standards of engagement are constantly increasing as technological trends are continuously improving. The levels of competency in dentistry are high due to the constant exposure to appropriate medical knowledge and facilities. Traditional research and treatment methods have proved to be inapplicable considering the quality of service delivery. One major reason is the tremendous improvement of technology which calls for highly developed procedures and facilities to be applied. The current dental informatics supports improvement in dental care because they create space for extensive research operations to be conducted. The immediate result of this is a case where patients are and dentists rely on advanced treatment procedures. Cases of guesswork and blind trials of medication have been eliminated from the system. This is because dentists tackle clear issues that they have a clear understanding about. This

ability initiates the use of accurate medical operations based on the dental, medical condition diagnosed.

DEVELOPMENT OF PATIENT'S RECORDS

Support systems have been developed to aid in the development of dental decision making to ensure that only the right decisions are made. It's the duty of informatics to ensure that dentists and other medical practitioners apply only the right medical procedures to solve their client's issues. The use of patient records in dentistry is likely to pose some economic benefits to clients. A good example is the provision of cost effective services thus making it possible for patients to seek dental services in any firm. Dental informatics automates dental records to offer quality services to patients. All the fields in medicine require the participation of highly decisive practitioners for purposes achieving the desired goals. Biomedical knowledge levels are now improving thus posing some positive impacts to the entire dental field. Many medical fields have not successfully applied the use of biomedical informatics. This implies that there are challenges that are experienced in the operation, and they ought to be eliminated. Success can easily be achieved by making sure that all negative hindrances are eliminated from the system. This elimination of unfavorable practices can shape a new medical system in the dental field of operation.

By understanding the challenges, dentists have managed to rely on informatics to improve and enhance their operations. Technological advancements have been experienced worldwide and they are currently portraying recommendable improvements. As such, the dental field has been on the run to ensure that all advancements are sought and applied. During the 1980s, computers were used in dental facilities for computerized billing purposes. The system changed later developed to accommodate operations such as student tracking and keeping patient records. Research operations were also developed and this gained the term biomedical informatics. The name informatics was developed because of the aspect of providing dentists with important information applicable in handling dentistry cases (Titus, 2009).

DENTAL RESEARCH AND EDUCATION

Biomedical informatics is known to facilitate the performance of important operations successfully. All the necessary materials and treatment methods

are well analyzed in the provided information. Because of that factor, the system creates a strong connection between and the flow of data between different dental activities. These include issues like clinical care, educational factors and conducting medical research. The current state of dental informatics has improved thus indicating a positive improvement in the administration of dental services. The quality of service delivery has improved because of the creation of a positive and lasting relationship between patients and dental officers. All information regarding the cases being handled is well analyzed hence creating a mode of satisfaction among the patients. The dentists benefit from the support to the extent of performing quality work. People tend to underperform when their working environment is stressful and lacks all the necessary knowledge and materials. This is not the case in dental health facilities simply because of the ease with which data is accessed and applied in real medical operations. The feeling of satisfaction among patients arises from the exposure to all the medical data records regarding their ailments and administration of medical operations. The availability of reliable record keeping methods enables both patients and dentists to keep track of the medical operations directed to the patients. A close contact relationship is also created by informatics to enable them keep a reliable monitoring of their patient's improvements and wellbeing. This enables them to determine whether to continue administering medication or to stop depending on the dental health status of the patient. Biomedical informatics supports the delivery of collaborative care by performing tele-dentistry operations. Achievement of this goal will make sure that more positive results are achieved for the benefit of the patients. The improvement of operations in dental healthcare benefits the dental facility, dentists and the patients. The informatics side should thus be well supported to help develop a stable environment that is of great benefit to all the people in interacting, with the system. Just like any other health department, dental healthcare is faced with numerous challenges. Better performance and elimination of these challenges can be achieved only by applying dental informatics. This method of providing medical information makes it for dentists to apply reliable workflows owing to the coordination provided. Cases of confusions and delays are eliminated from the systems for the

purposes of delivering quality services. In dental healthcare, the use of biomedical informatics acts as a useful source of awareness. After medical research is conducted, an overview of different dental health complications is attained.

DENTAL AWARENESS

Dentists use this information to create awareness on the issues they should avoid if they pose huge risks to their dental health. With an awareness created, biomedical informatics supports the curbing of negative practices that cause dental problems. This knowledge is important for patients as they become their own doctors by avoiding all causative agents of dental diseases. The research done under dental informatics provides information that is useful on different perspectives. As clients learn how to protect themselves, dentists learn all the practices that can be applied to help the patients recover from the complications. These factors make biomedical informatics an important segment on healthcare that should be sought by every individual. The immediate results realized after using dental informatics is the delivery of quality services which drive dental patients towards recovery. Biomedical informatics plays important roles in dental health thus creating an importance of it being applied in all segments of human healthcare. The data collected from research operations helps patients in the prevention process to avoid being attacked by dental diseases. High preventive measures reduce the need for oral care treatment procedures because they help improve immunity. Reduced treatment procedures also reduce the costs associated with dental treatment because no cases of dental ailments are reported. The use of biomedical informatics is thus directly linked with the aspect of saving client's finances. This aspect creates enough room for dental officers to concentrate their services on needy patients within the vicinity of the health facility. Serving a small number of affected patients assures them of quality services owing to their recovery. Preventive mechanisms are not applied by the patients alone because the dentists have a high knowledge in this field. With preventive practices administered by the doctors, the emergence of new cases of dental complications is highly prevented. The preventive services are offered to the general public because it's the duty of health officers to mind the health needs of their society. This practice

supports the assertion that biomedical informatics support the wellbeing of the entire society.

Dentists have no worry regarding the treatment of dental complications because they can efficiently conduct research. The research helps them determine the most appropriate treatment methods. Preventive mechanisms are easily developed and applied simply because research devices are readily available. The use of computerized methods of research and provision of medical data assures perfection and accuracy. Data storage and use of better research methods makes the dentistry field more efficient. These improvements are numerous compare to the traditional dental healthcare procedures that did not rely on any scientific methods. Dental informatics allows the use of signal and biometrics in acquiring and storing patient's data. Image processing is another data collection and evaluation criteria that increase the scope of understanding regarding some complicated dental cases. Dental services cannot be performed without the use images hence the need for image processing methods. The provision of well displayed images makes it easy for dentists to come up with appropriate methods of handling cases. Informatics support dental care by providing information related to psychomotor skills which delivers instructions in dental restorative operations.

VIRTUAL LEARNING ENVIRONMENTS

Psychomotor skills allow the use of DentSim procedures which lead to the creation of virtual learning environments. It thus creates a platform where dental officers and students can identify their levels of competency in restorative operations. This practice beats the traditional learning system that was termed as slow and lacked the necessary resources that facilitate the development of competency levels. DentSim procedures make it easy for students to acquire large volumes of learning material over short learning sessions. Biomedical informatics avail all these capabilities, thus occupying an important position in healthcare. The availability and access to biomedical informatics improves the administration of dental health services. The integrity of dental healthcare relies on the use of scientific learning methods and research data collected through informatics.

PROVISION OF APPROPRIATE TECHNOLOGY

Regarding psychomotor endodontic skills, biomedical informatics provide simulation technology, which relies on the use of phantom desktops. The students are thus fully competent when they complete their learning session in dentistry educational facilities. Simulation software and applications are developed to enhance the administration of knowledge to dentists and dental students. Three benefits are achieved from this system, and they assist in the development and quality output of in dentistry. These include the use of innovative approaches which include improving dental hygiene. Dental anatomy knowledge is also provided and for purposes of supporting the stability of pre-doctoral dental services. Stereoscopic 3D teeth models are effectively used to ensure that the students are well acquainted with 3D structures. All these are educational modes that are provided by biomedical informatics to dentists, fir them to upgrade their operations. High technological systems such as the use of E-textbooks are also introduced in dental institutions. The immediate result is cases where dental officers operate in a stable environment that has everything they need (Titus, 2009). With a stable access to information and technological devices, dentists manage to perform complex operations without any hindrances. As such, learning systems in dentistry are highly improved due to the presence of standard and upgraded data acquisition methods. Biomedical informatics ensures create easy learning platforms where data can be analyzed easily by dentists. This efficiency makes it easy for them to access any data in cases where references ought to be made. Operations can thus be undertaken at any time and place due to the ease with which data is availed. The use of technology makes sure that all the merging issues in technology are invested in for the benefit of dental services.

IMPROVES SERVICE DELIVERY

Positive changes have been realized in the dental field owing to the application of dental informatics. Upgraded operations have also been witnessed thus leading to the satisfaction of patients. Fully equipped dentists deliver quality services for the benefit of their patients. Dental informatics now create a challenge of determining necessary technologies that can upgrade the system. As

technological advancements continue to take place, the dental sector will need to implement new strategies for better operations to be achieved. The presence of favorable technologies ensures that duties are well performed with a clear target focused on the set results. The use of biomedical informatics improves teaching methods and content by availing standard teaching methods. Improved materials are also provided and they aid in the development of medical infrastructure. Creativity is enhanced among the dentists as they research on what practices and technologies are required to upgrade the system. The availability of technology and high quality research content improves the creativity and knowledge levels of students. This happens to be the reason why dental service delivery has improved, unlike in the past. The dental field is a constant learning environment that is continuous thus creating the need for new interventions.

CONCLUSION

In conclusion, the dental field is now becoming complex due to the development of technology. Biomedical informatics is providing special data which can only be applied through the use of high quality materials. This implies that informatics

promote the use of new and advanced technological devices and procedures. Applying new strategic technologies and operations, achieving dental health goals will become an easy task. Applying improved technologies will ensure that research methods are upgraded and good results achieved. A good example is the introduction of well programmed software and programs to meet the educational and knowledge needs of dentists. It's clearly understood that biomedical informatics facilitate the creation of a positive, productive environment in healthcare. Dental informatics also make it possible for dentists to analyze patients and develop action plans that are likely to deliver positive results. The same form of information enables them to evaluate all the implemented strategies to monitor their efficiency or any form of laws. Identified discrepancies are eliminated for purposes of improving the integrity of the healthcare sector. Another role undertaken by biomedical informatics in dentistry is creating a learner oriented information infrastructure. Students are thus provided with important information that is necessary for their operations. The ease with which data is read and analyzed makes it easy for students to improve their dental knowledge and skills.

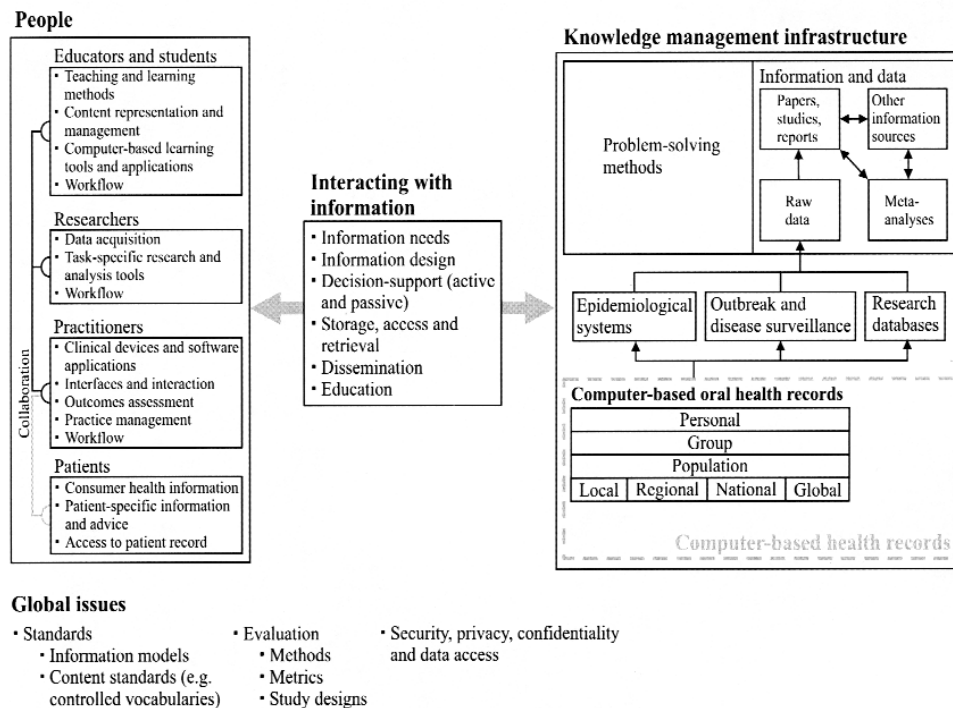


Figure 3: A Map of research challenges in Dental Informatics, T.K. Schleyer. Center for Dental Informatics, University of Pittsburgh, School of Dental Medicine, 3501 Terrace Street, Pittsburgh, PA 15261; titus@pitt.edu. Adv Dent Res 17:9-15, December, 2003)

Biomedical informatics recognizes that biomedical information is studied and utilized by people. It thus emphasizes on behavioral and social sciences that solve health problems experienced by people in the society. Dental informatics engages in the creation and evaluation of technical procedures that are used in solving dental care problems. The roles conducted by BMI are numerous and of great importance to this field. The data collected from the research enhances, simulation, and modelling of appropriate techniques essential in solving dental problems. Computing and communication are enhanced in dentistry because most of the provided data require proper analysis. This analysis requires the interaction of all the involved people. Dentists and patients interact freely as they discuss on the most appropriate action plans able to solve their problems.

Dentists have benefited from the direct access to dental informatics, especially the application and use of scientific methods. Patient problems are now being efficiently solved due to the presence of high quality data and operational methods. The availability of important operational data enables dentists to make wise decisions regarding patient treatment. The operational success witnessed in dentistry is supported by the ability of the informatics to adopt scientific theories and technologies. This ensures that dentists are provided with all the necessary material for them to deliver good results. Dental informatics have been of great importance to both patients and dentists. Students have acquired high quality education, thus improving their competencies. Dental informatics will facilitate the stability of the dentistry because of

its adaptability nature and ability to cope with new developments. The use of dental informatics should be applied in all health sectors to make sure that service delivery is improved. The availability of high quality information is essential for the development of a perfect medical system. Dentistry will continue to improve as technological advancements take place.

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