A Survey of the Implementation and Usage of Electronic Dental Records in Private Dental Practices in Mississippi

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Abstract

Implementation of electronic health records by the Health Information Technology for Economic and Clinical Health has led to the implementation of electronic dental records in dental offices. The study was conducted to determine the state of implementation and usage of electronic dental records by the private general and pediatric dental practices in Mississippi as well as reasons why the dental practices are not moving forward with the advanced technology. A survey consisting of six research questions was emailed via SurveyMonkey to 712 private general and pediatric dental practices in Mississippi with an invitation to participate in the study: 116 responded (16% response rate) and 104 consented to participate (89.66%). The data collection process transpired over a six-week period (September 18 – October 29, 2017). Results of the survey indicated dental practices in Mississippi using electronic dental records were 46.07%, electronic dental records with paper records were 42.70%, and only paper records were 11.24%. Dissemination of the study results among medical and dental practitioners may raise awareness and thus encourage more dentists to embrace EDRs. The response rate was affected by the number of dental practices that chose not to participate or did not open the survey email as well as the number of emails that were undeliverable. A second limitation was the lack of certainty of collecting all email addresses through the collection method. Third, there was no certainty that the person who responded knew the correct answers.

Keywords: dental informatics, dental care delivery, health care quality, access and evaluation, health information technology, patient care management

1. Introduction

Advancements in electronic technology have enhanced clinical documentation and led to the integration of patients' personal information and medical records via electronic health records (EHRs).[1,2] In 1991, the Institute of Medicine issued a report advocating the

implementation of EHRs within ten years in health systems.[3] The implementation of EHRs by physicians increased from 18% in 2001 to 57% in 2010.[4] On February 17, 2009, the Health Information Technology for Economic and Clinical Health (HITECH) was signed into law as part of the American Recovery and Reinvestment Act. A primary objective of the HITECH was the nationwide implementation and usage of EHRs.[2,5,6]

In the dental profession, chair-side computers function as the computer-based patient records which store and manage clinical data and digital imaging.[7] The Center for Dental Informatics conducted a survey in 2004 through 2005 to determine the percentage of general dentists in America using chair-side computers as well as the percentage of offices which are totally paperless. The results indicated that 25% of the general dentists had implemented chair-side computers in the office and 1.8% offices were entirely paperless.[7] In 2006, data collected from a survey conducted by the American Dental Association (ADA) revealed that the implementation of chair-side computers had increased to 55.5% and the percentage of offices that were entirely paperless increased to 9.5%.[8] On June 15, 2010, the Government and Public Affairs Division of the ADA posted a summary of the HITECH provisions providing information of interest to dentists. The summary acknowledged that the implementation and use of electronic dental records (EDRs) by the HITECH pertained to private practice dentists, the dental profession, and dental schools.[9]

In 2013, Schleyer et al.[10] conducted a survey to determine the use of EDRs by members of The Dental Practice-Based Research Network (DPBRN). The DPBRN members were "a consortium of dental practices with a broad representation of practice types, practitioners, and treatment philosophies".[10] The data from the survey indicated that 73.8% of the solo practitioners used EDRs to store patients' information and 14.3% were entirely paperless. The results indicated that 78.7% of the group practitioners used EDRs and 15.9% were paperless.[10] Over a period of eight years, the number of general dentists and dental groups using EDRs has grown from 25% to 75% which signifies the importance of incorporating the EDRs by every dental practice in Mississippi and throughout the United States.

2. Literature Review

2.1 Advantages of EDRs
Advantages of implementing EDRs include the standardized terminology within the record, entry of the information into EDRs can be quicker and more efficient as well as more comprehensive than in paper records. Improvements include easier, faster access to clinical information, and improved legibility of the documentation as well as the accountability and efficiency of the staff. The accessibility of information through electronic records improves communication between patients and providers and during consultations with dental specialists or other multidisciplinary team members.[11]

2.2 EDRs and medically complex conditions.
According to the United States Surgeon General's report on *Oral Health in America*, "oral health is essential to the general health and well-being of all Americans".[12] The report included findings from studies that indicated an association between periodontal disease and systemic diseases such as cardiovascular disease, diabetes, immunocompromised diseases, stroke, and detrimental pregnancy outcomes.[12] Systemic factors such as diabetes, leukemia, genetic risk factors, systemic medications, hormonal alterations, and osteoporosis are significant risk factors for periodontal disease.[13] Therefore, dental and medical professions must collaborate to improve the management of care for patients with medically complex conditions.[13,14] Collaboration using EHR systems benefits the patients as well as the dental and medical teams.[14] The proven relationships between systemic diseases and oral health

conditions support incorporating EDRs in dental practices. The collaboration of the medical and dental professionals through electronic record systems provide patients with optimum health care.

Collaboration of dental and medical professions can improve the management of care for patients with medically complex conditions.[13,14] Little literature exists on the integration of patients' records by the medical healthcare providers and the dental care providers to assist in providing optimum health and dental care; however, a collaboration among the providers can be beneficial for the patients. Collaboration between the medical healthcare providers and dental care providers can increase patient safety, decrease the change of medication errors, and notify the dental providers of patient's allergies and health issues. Additionally, knowledge of the patient's health history increases the patient's confidence in the dental care provider.[15]

Fricton et al.[14] conducted a two-year randomized clinical study to determine the effect of using EDRs in clinical settings for patients with medically complex conditions. Fifteen dental clinics were randomly selected from the HealthPartners Dental Group (HPDG) and divided into three groups. Clinics in the first group received alerts through the EDR when a patient had a medically complex condition. In the second group, patients with medically complex conditions received alerts from the HPDG. The alert notification sent via email, mailed letter, or patient health record recommended to the patients to confer the condition with their dental care provider. The patients and the dental care providers in the control group did not receive alerts. The study provided alert notifications for the following complex medical conditions: diabetes mellitus, xerostomia caused by medications or a salivary condition, congested heart failure, and chronic obstructive pulmonary disease. When receiving alerts, 63-73% of the dental care providers reviewed the clinical care guidelines for patients with medically complex conditions. The alert notification received by the dental care provider was more effective than relying on the patient to bring it to the provider's attention. Overall, the results of the study showed that the use of an EDR system by dental care providers improved decision making and increased the efficiency and effectiveness of the care of patients with medically complex conditions.[14]

Emerging from the implementation of HITECH, the number of dental offices using EDRs is growing. The purpose of this study was to determine the state of the implementation and use of EDRs by the private general and pediatric dental practices in Mississippi as well as reasons why the dental practices are not moving forward with the advanced technology. The following research questions guided the study:

a. Are private dental practices in Mississippi currently using electronic dental records?

b. What factors influence the selection of paper dental records or electronic dental records by private dental practices in Mississippi?

Dissemination of the study results among medical and dental practitioners may raise awareness and thus encourage more dentists to embrace EDRs.

3. METHODS AND MATERIALS

3.1 Research Design

The research design was a non-experimental cross-sectional quantitative design with a locally developed survey instrument. The cross-sectional study was facilitated by a questionnaire that was administered using SurveyMonkey after an invitation to participate with a hyperlink to the survey was emailed to the study's population (see Appendix A). The survey questionnaire developed by the researcher was standardized and each participant answered the same six questions.

Once approval (IRB Protocol No. 0817.14e) from the Institutional Review Board at East Tennessee State University (ETSU) was obtained, a pilot study established the validity of the survey instrument. The participants in the pilot study were five members of the dental faculty from the School of Dentistry at the University of Mississippi Medical Center (UMMC). The Dean of

the School of Dentistry granted permission to contact the dental faculty via email and to provide them with a link to the survey. The email explained the importance and purpose of the pilot study and requested that the dental faculty answer the survey questions and record the time it took them to complete the survey. The faculty was asked if any questions should be added, if any questions should be deleted and if any questions should be reworded or clarified. They were also asked to provide any comments to assist in validating the survey. Instructions were provided in the email to use the space provided for Question 6 to submit their recorded time and comments about the survey.

Suggestions from the pilot study resulted in inquiring when a practice plan to convert to EDRs. Inquiring when is beneficial in determining the future of EDRs among the population of the study.

3.2 Population

The population of the study included the current private general and pediatric dental practices in the state of Mississippi. The study concentrated on private practice dentists who provided comprehensive oral health care to patients; therefore, periodontists, endodontists, orthodontists, and oral surgeons were not included. Private practices with more than one dentist were provided with only one survey since the unit of analysis of the study was a dental practice, not individual dentists. According to the Mississippi Dental Examiners website, as of April 5, 2017, Mississippi had 1128 active general dentists and 66 pediatric dentists.[16]

Email addresses for the population were collected from the Mississippi State Dental Examiners' website. The website provided specific information on each licensed dentist in Mississippi. The information included specialty title if applicable, email addresses, and the name and address of the dental practice where each dentist practiced as well any satellite office(s). The list of email addresses was created by searching the website for the general and pediatric dental offices by county while eliminating specialty offices. The collected list consisted of 712 dental practices.[17]

Anonymity was maintained by using email addresses to provide the survey link. Names and addresses of the population were not associated with the email addresses. No personal information was collected from the survey. The respondents' Internet Protocol Addresses were not disclosed from the responses making the results anonymous. Confidentiality was maintained by using SurveyMonkey's security technology. Transport Layer Security encrypted the respondent traffic which protected communications by using both server authentication and data encryption. This ensured that the user data in transit was safe, secure, and available only to intended recipients.

3.3 Data Collection Procedure

The data collection process transpired over a six-week period (September 18 – October 29, 2017). The email sent to the population provided a description of the study, statement of confidentiality of the survey, and a statement of informed consent. Informed consent to participate was gained when the participant answered the first question of the survey. The respondents were asked to respond within ten business days of receiving the email.

Two weeks after the initial emailing, a reminder email including the survey link was sent to all non-respondents. Non-respondents were determined from a non-respondent list provided by the survey software. Four weeks after the initial emailing, a follow-up communication via an email containing the survey link was sent to all non-respondents requesting a response within ten business days and emphasizing the importance of the study.

Eleven business days after the emailing of the follow-up communication email, the final data was collected from the submitted surveys. The data was exported from SurveyMonkey into Microsoft Excel.

3.4 Data Analysis

The data collected were exported from the survey software and analyzed using Microsoft Excel. A response rate (r) was determined by dividing the number of completed surveys (c) by the population number (s) and multiplying the quotient by 100 (r = c/s X 100).[18] Descriptive statistics were computed.

4. Results

Of the 712 invitation emails sent to the population, 444 emails were opened, 204 emails were unopened, 52 opted out of the study, and 12 were undeliverable. Six hundred sixteen responded to the invitation to participate resulting in a 16% response rate. Of the 116 respondents, 104 consented to participate (89.66%), 12 respondents did not participate.

Demographic data from the survey provided the number of years the practices were established at the current location as well as the location of the practices:

- Years at location-percentage of practices: Less than 5 years – 18%; 6-10 years – 17%; 11-20 years – 25%; 21-30 years – 17%; over 30 years – 24%.
- Location-percentage of practices: 49% in rural areas; 32.58% in suburban areas; 22.47% in urban areas (Figure 1).
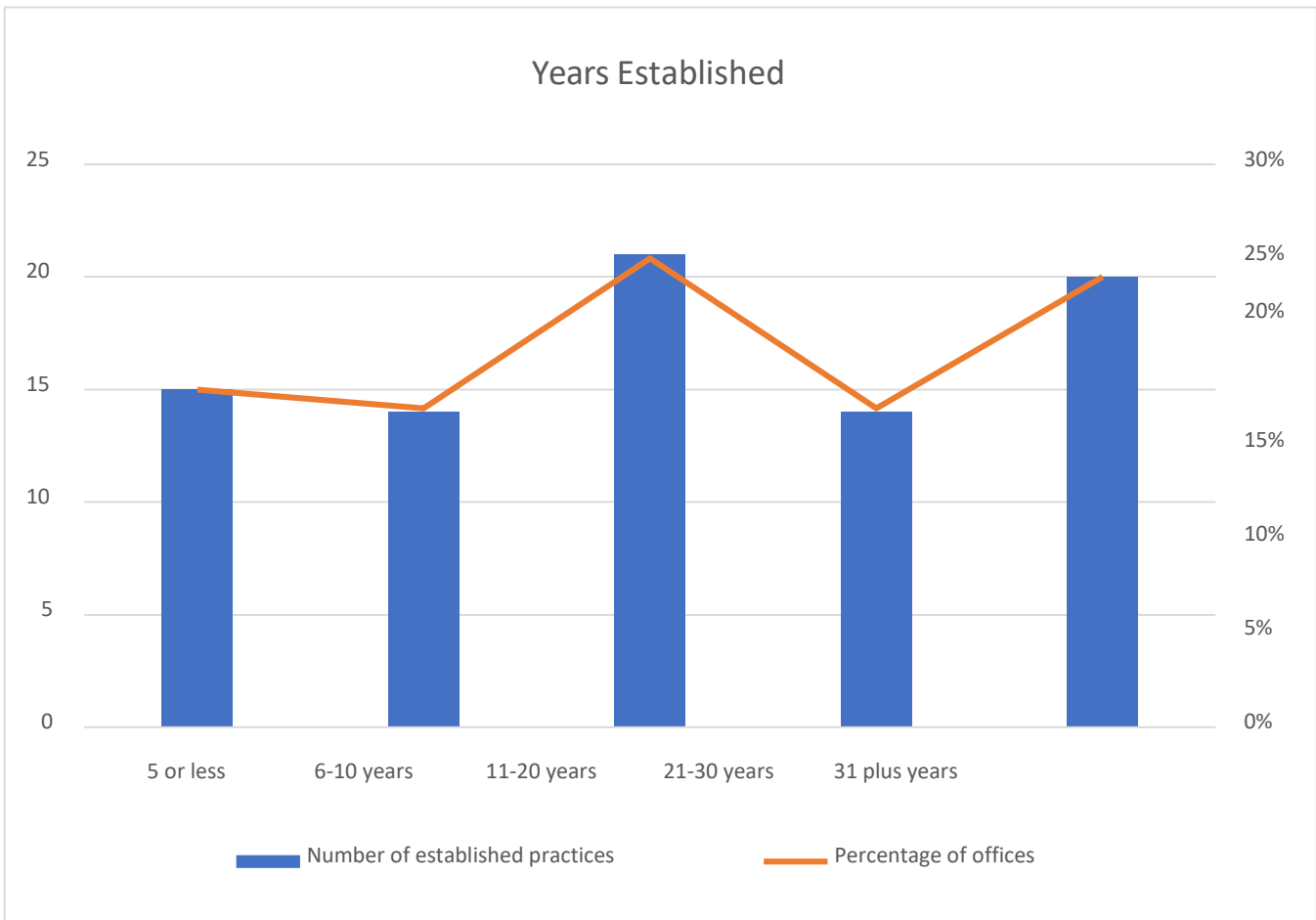

Fig. 1. Number of Years Current Practice Established

4.1 Electronic Dental Records

Dental records used by the dental practices were EDRs, electronic dental, and paper records, or paper records. Most private practices used EDRs or EDRs with paper records (Figure 2).
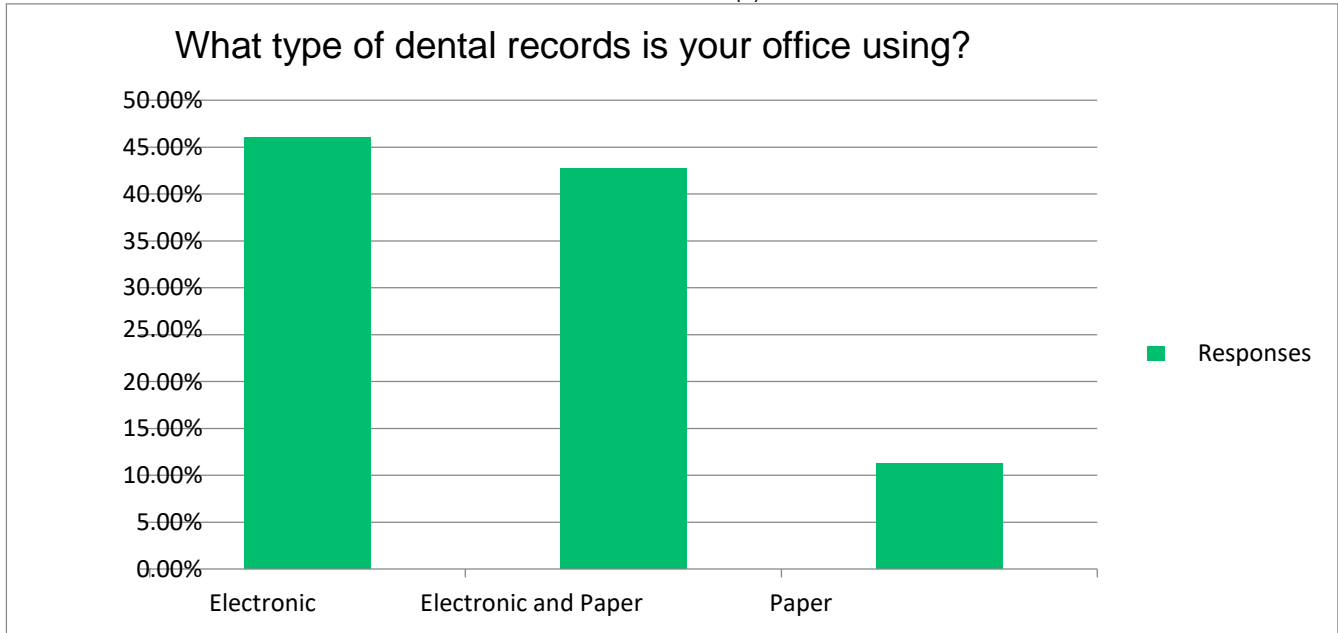
Fig. 2. Type of Dental Records

Factors that influenced the selection of paper or EDRs were collected from the survey. Common factors among users of EDRs and EDRs with paper dental records were: keeping up with technology, efficiency, ease of use, time saver, storage, insurance processing, and EHR mandate per government. Common factors among users of EDRs with paper records and paper records only were: cost of conversion, computer issues, and "old habits" or too old to change.

Other factors provided by the respondents using EDRs were: convenience, the standard of care, EHRs mandated by the government, and dental electronic software pre-existing in practice. Two mobile dental units use EDRs for easy access to dental records between the two mobile units when operating at different locations. One dental practice accepted grant funding from Medicaid that required the practice to convert to EDRs.

Several practices using EDRs with paper records were using EDRs only to send electronic insurance claims and to store digital radiographs. They were still using paper dental records to record patient notes and as a backup if computers failed. Additional factors for using paper dental records along with EDRs were time-consuming to scan old documents into the computer and paper dental records pre-existed in the practice.

Factors influencing offices to use only paper dental records were familiarity, lack of knowledge of electronic records, and no desire to change.

4.2 Electronic Dental Records Conversion Plan Data
Data from the survey indicated that 64.81% plan to convert from paper to EDRs. Several reported that they are already in the process of converting to EDRs. Some practices provided a time frame such as within six months, two years, and three years for their conversion. Two offices were using EDRs that are cloud-based. Other answers were: uncertain, when mandated, and when I can afford it.

Data indicated that 38.89% practices were not planning to convert. Reasons provided for not converting were cost, no desire to change, lack of trust in digital records, computer problems, no training available for employees, and reticence for a major overhaul at this point in my practice. Some respondents referenced the years the dentist had been in practice. The dentist will retire soon; therefore, it would not be beneficial to change at this time due to cost and

knowledge. Another respondent's answer referred to using EDRs; however, the office keeps a hard copy of the patient's health information and the current treatment plan. The respondent believed these two items are too important to lose because of technology failing.

5. Discussion

The open-ended questions in the survey provided feedback to determine the reasons why some dental offices in Mississippi had not moved forward in technology. The most common factors that influenced offices to use paper records along with EDRs or paper records only were cost, distrust in computer technology, and lack of training. Of these, the cost is not surprising; however, distrust in computer technology and lack of training were unexpected. Dentists are reluctant to accept any change that is costly. From the researcher's experience, the cost of the improvement is the main item discussed when implementing improvements. To transition from paper records to EDRs requires the purchase of computers in every operatory, EDR software, digital radiography software, digital radiography equipment, and dental team training. Staying current with technology assists in providing patients optimum oral health care. Electronic dental records provide an avenue to discuss care with the patients. Periodontal charting in the software and digital radiographs are effective educational tools.

With technology advancing, computers are part of everyday life. Having a "computer person" available to assist with issues as well as offsite backup storage are answers to computer issues. The "computer person" can address the issues personally or remotely from his office. Results from the data indicated that some offices were using paper records to record patient notes and as a backup if the computer failed. One office kept a copy of the patient's treatment plan and health history to avoid losing the information due to computer failure. Back-up systems are available to create a backup of the data every night and transfer it to a secure offsite location through the internet. The backup system is more reliable than paper records which can be destroyed by fire, flooding (due to plumbing issues or sprinkler systems), or natural weather disasters.

As for training, the majority of the dental staff are required to complete continuing education (CE) courses every year. The dentist and staff could receive training through CEs. When the office purchases the dental software program for the EDRs, training is part of the package. Lack of knowledge of electronic records was another factor collected from the data; however, every respondent answered the survey through an email which suggests that they are computer knowledgeable enough to use emails. Change and improvement require learning; therefore, the knowledge of EDRs could be obtained through CEs or training from the software company.

The factors which influenced offices to use EDRs with papers were: keeping up with technology, efficiency, ease of use, time saver, storage, insurance processing, and EHR mandate per government. These factors promote several benefits of using EDRs. Electronic dental records are efficient, time-saver, and easy to use. Every patient requires a chart, and after years of being established the number of charts increases as well as the space needed to store the charts. The implementation of EDRs eliminates the need for paper charts as well as the storage space needed to maintain the patient's paper charts.

The data indicated that several practices were using EDRs only to send electronic insurance claims and to store digital radiographs. Paper charts were used to record treatment, treatment plans, and patient's health history. In recent years, many of the insurance companies established a policy to accept only electronic claims; therefore, dental offices that filed patients' insurance had to implement the use of dental software and obtain internet access. The EDR software enables the office to document the patient's health history and includes a clinical chart that records the patient's treatment and treatment plan. In addition, the software includes patient scheduling and billing applications.

Another reason for not advancing with technology could be the number of years the practice had been established. The average number of years the offices responding have been established is 25 years. The offices who gave the answer "no desire to change" have been established the longest. Statements provided by several offices indicated that these dentists were trained using paper records; however, the offices established for ten or less years indicated that the dentists were trained using EDRs. As stated previously, training that current dental students receive include EDRs. Training is available through CE courses.

Being "too old to change" is not an acceptable reason. First and foremost, patient care should be the primary focus of every office. As previously stated, advancement in technology can help to provide patients the optimum oral health care. Additionally, the lack of implementing the technology advancements in the practice can lower the value of the practice. At retirement time, the value of the practice will be lower than it would be if the current technology was already implemented. New graduates looking to purchase dental offices will be more interested in offices that are up-to-date.

6. Conclusions

As stated previously, the number of dental practices in Mississippi using EDRs (46.07%) was not remarkably higher than the number using EDRS with paper records (42.70%). Advancement in computer technology is evident in every profession. The implementation of EHRs by the signing of the HITECH in 2009 is a prime example of progress in computer technology in the medical field. According to a study in 2015, 84% of the hospitals in the U.S. had implemented EHRs.[19] In 2013, 78% of the office-based physicians had implemented EHRs.[20] In hospitals, EHRs have become an effective and efficient avenue for communication and provide health information such as clinical findings, clinical manifestations, diagnostic, assessments, diagnosis, and etiology.[21] Even though the ADA encouraged the implementation of HITECH through the use of EDRs by dental practices in 2010, the data from the survey shows that many dental offices in Mississippi have not accepted the change in technology.[9] Even though the majority of the offices using EDRs with paper records have started the process of upgrading or have plans shortly to upgrade, 32% of the offices have no intention of discontinuing paper records. Offices using only paper records don't have any intentions to upgrade. As stated previously, the reasons provided for not transitioning to only EDRs were distrust in computer technology, cost, lack of training, and past computer/software issues.

How accurate are these results? Is this the true picture of the implementation and use of EDRs among the dental offices in MS? Only 116 of the 712 emails responded sent making the respondent rate 16%. The results don't represent the majority of the dental offices in MS. However, the results do provide insight into why offices haven't transitioned. From the offices using EDRs, the results render the benefits of EDRs.

The benefits of EDRs are the same for dental offices as EHRs are for hospitals and office-based physicians. Growth and improvement in a dental practice require accepting the increased cost, training of dentists and staff, and implementing computer technology. Hospitals have a more substantial number of patients than dental offices; however, the benefits of using EHRs out ways the risk of the technology failing.

Electronic health records in the medical field provide communication between physician and patient, physician and physician, and hospital and physician's offices. The proven relationships between systemic diseases and oral health conditions support incorporating EDRs in dental practices. The future technology could be the collaboration of the medical and dental professionals through EHR systems to provide patients with optimum health care. Advancements in technology are a given; therefore, to provide optimum oral health care, the "old school" dental professionals must accept change.

Dental professionals need to accept that improvement and keeping up with technology is costly; however, an increase in the demand for the EDRs can help to reduce the cost as well as including training as part of the purchase of the software program. With the implementation of HITECH, states could mandate the implementation of EDRs and could offer financial incentives similar to the incentives offered to medical providers enrolled in the Medicare Program using EDRs.

7. Limitations

There are limitations to this study that should be considered in the analysis of the data. First, the response rate was 16%. The response rate was affected by the number of dental practices that chose not to participate or did not open the survey email as well as the number of emails that were undeliverable. Some of the survey emails were possibly marked as spam. A second limitation was the lack of certainty of collecting all email addresses through the collection method. The method involved searching for the general dental offices per county on the Mississippi State Board of Dental Examiners' website as well as the pediatric dental offices while eliminating other specialty practices such as periodontal, endodontic, and oral surgery offices. Third, there was no certainty that the person who responded knew the correct answers. Even though a survey was emailed to the email address provided on the website for each general and pediatric dental office, the person answering the email might not have known the factors that influenced the current type of records, the number of years the practice had been established, and/or the difference in urban, rural, or suburban.

8. Further Research

Future research can be done to further understand the status of implementation and usage of EDRs in private dental practices in Mississippi by surveying a different state. The results will show if the state has been more successful in implementing EDRs. If the state has been more successful, the study can provide factors that influenced the success.

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APPENDIX

Survey Instrument

1. By selecting "I Agree", you are consenting that you have read the above information, volunteering to participate, and at least 18 years old.

    o   I AGREE

    o   I DO NOT AGREE

2. How many years has your office been at the current location?

3. Where is your practice located?

   o Urban

   o Suburban

   o Rural

4. What type of dental records is your office using?

   o Electronic

   o Electronic and Paper

   o Paper

5. What influenced the selection of your current type of dental records?

6. Does your office plan to convert to electronic records?

   If yes, when?

   If no, why?