CUSTOMIZING AN ELECTRONIC MEDICAL RECORD IN ONE RURAL HEALTH AREA: THE IMPACT ON PATIENT APPOINTMENTS

by

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Abstract

Purpose: To analyze the effect and use of electronic medical record systems on appointment compliance in one small rural health clinic.

Design: Quantitative study. Appointment compliance was analyzed using population data pre-implementation of an electronic medical record and post implementation of an electronic medical record.

Key Words: electronic medical record, patient portal, rural health clinic, appointment compliance, evidence-based practice, patient empowerment, appointment scheduling

Methods: The data was collected in a 6 month period in 2015 from data recorded in paper scheduling books and electronic medical records. The population data gathered was analyzed using the International Business Machines Corporation (IBM) Statistical Package for Social Sciences (SPSS) version 20.0 software to determine the percentage of patients who missed appointments pre-implementation and post implementation of the electronic medical record.

Findings: Results indicate an 8% no-show rate while using paper documentation and a 12% no-show rate after implementation of the electronic medical record. These findings indicate that the implementation of an electronic medical records system using alerts for notification of appointments was not conducive to improvement in the no-show rate. Multiple factors could indicate the cause of the increase in percentages of no-show after implementation such as time of year, skill level of user, adaptation to new method of notification, and short time frame from implementation.

Conclusions: These findings suggest that the project could be duplicated to determine if a larger study with a longer time frame would make a difference in the outcome. Currently the findings

indicate that in one small rural health clinic, implementation of an electronic medical record system did not improve patient appointment compliance.

Clinical Relevance: The use of an electronic medical record will enhance the clinical care of patients by ensuring formats which provide easier access to medical data. The clinical relevance of an electronic medical record becomes apparent in the ease of storage of relevant patient documents and information (Davis & Haines, 2015).

Introduction

The implementation of electronic health records (EMR) is important to clinics across America as outlined by the recommendations handed down by the Department of Health and Human Services (HHS) through the Health Information Technology for Economic and Clinical Health (HITECH) Act (www.healthit.gov). Rural areas need the same type of information data gathering tools which have been employed in large urban areas. The importance of establishing electronic health record systems in rural health clinics is essential to promoting quality health care globally.

BACKGROUND

The goal was to determine the impact on appointments in one small rural health clinic through the implementation of an electronic medical record system. The commitment to customize and implement an EMR for the clinic was important in determining if appointment compliance was significantly different after implementation of the EMR. Prior to implementation of the EMR, the rural health clinic used paper documentation. Scheduling was done via a scheduling book by the clerk who gave the patient a card with the date and time written down for the follow-up appointment. The EMR allowed the clerk to input appointments into the electronic system which had an alert system to notify patients of upcoming appointments. The goal was to determine if an alert via text or e-mail triggered by the EMR would improve appointment compliance at the rural health clinic.

Local Problem

A gap in care was noted at the clinic when patients did not show up for their scheduled appointment. The importance of patients showing up for their appointments was found to be an indicator in the clinics' financial sustainability. The rural health clinic relied on funding from local, state, and federal entities which were directly related to the number of patients seen in the

clinic. When the number of patients seen decreased, the count for the clinic diminished causing funding allocation to be affected. For the fiscal year 2014 through 2015, the rural health clinic was allocated $229.00/patient with a projected goal of 799 patients to be seen in the primary health care (PHC) program. In the women's health program of Texas (TWHP), the clinic was allocated $195.00/patient with a projected goal of 570 patients. For the breast and cervical cancer (BCCS) program, the clinic was allocated $234.00/patient with a projected goal of 350 patients. The numbers of patients seen at the end of the fiscal year determines if the funds allocated will be adjusted and the cost per patient reduced. In the same formula, if the number of patients seen is greater than the projected number, the clinic will be allocated more dollars per patient. Therefore, the importance of alerting the patients to an upcoming appointment was crucial to the financial outcome of the clinic.

Intended Improvement

Electronic health records offer positive changes to providers through better communication, better patient outcomes, increasing clinic efficiency, and being cost effective (Pearson, Brownstein, & Brownstein, 2011). Patients are empowered through autonomy in the use of personal patient portals. The use of personal patient portals is a positive step toward empowering patients by allowing them to access their own health records with access to alert systems for upcoming appointments (Savinon, Taylor, Canty-Mitchell, & Blood-Siegfried, 2012). The goal was to decrease the amount of missed appointments or "no show" appointments by notifying the patient via electronic media prior to the date of the upcoming appointment.

Study Question: "In patients attending a rural health clinic, how does implementation of an EMR system improve compliance related to missed appointments compared to the use of paper documentation?"

METHODS

Ethical Issues

The risk to the patients under this project were minimal as outlined by the Human Subjects Protection methods. Collection of data for this project did not entail any face to face contact. Risk to the patient was minimal as the data collected was quantitative in nature related to "no shows" or appointment compliance. Confidentiality of the records/data was maintained at all times with the collected data kept under lock and key. No person other than the project manager had access to the data at the institution where the data was collected. Once the data was collected and analyzed, the proper disposal by shredding was carried out per CITI recommendations. No identifiable patient data was collected or utilized in the project.

Inclusion criteria for the project included all patients seen in a 3 month period prior to implementation including minorities and women. After implementation, all patients with known e-mail or text capabilities with appointments scheduled in a 3 month period were included. Those excluded were children under the age of 12 and anyone over the age of 65 as those patients are not seen at the clinic routinely. Secondly, any patient who did not furnish the clinic with an e-mail address or cell phone was excluded due to the inability to send notification alerts to them of upcoming appointments. No conflict of interest was found and the project was deemed exempt by the IRB of Capella University.

Setting

The project took place in a small rural health clinic where the goal was to determine whether the implementation of an EMR would improve appointment compliance. Previous studies indicate that adoption and implementation of an EMR allows data to be kept in a centralized location for easier access (Leibel, Currie, Gelowitz, Aldridge, & Kuncesicz, 2012).

The rural area is socioeconomically deprived; therefore, there was a concern that patients' economic status could have an effect on the outcome of the project. If patients' did not have access to a computer with internet services or a cell phone, the alert system on the EMR would not be practical. However, out of the 773 patients who scheduled appointments within the three months after implementation, the leader found that < 1% did not have access to a cell phone or internet services.

Planning the Intervention

The planning for this project included time spent with vendors of EMRs along with addressing the cost factor of the implementation of an EMR system. The clinic where this project was implemented is funded through local, state, and federal entities; therefore, there was no available funds to purchase an expensive EMR. Detailed planning included budget for equipment, the EMR system, personnel training, and a detailed outline of the timeframe to accomplish the customization and implementation of the EMR.

After the EMR was chosen, a contract with the vendor was negotiated. Patient demographics had to be uploaded into the system and updated with new information such as e-mail address and cell phone numbers. Training was done with all clinical staff and billing personnel to ensure a smooth transition. Templates were customized for the clinic which was time-consuming and ever changing due to updates from the EMR site.

The EMR system was officially implemented on August 1, 2015. As problems arose and upgrades to the EMR were made, they were addressed on a daily basis. The clinic did not have a technology person when the project began and the Doctorate of Nursing (DNP) project leader was responsible for maintenance and updates. However, since implementation of the EMR, an information technology (IT) person has been hired at the clinic. The DNP project leader continued to maintain the EMR until all data collection was completed at which time the

administrator of the EMR was changed to the IT person who was hired by the clinic after the project had been implemented.

Planning the Project

The implementation of the EMR and the comparison of data pre and post implementation was recorded for three months before and three months after the day of actual "live" implementation. An open cohort design to gather population data from those time frames to compare outcomes was utilized in the project.

The project was designed to ensure internal validity through double checking the count during data collection, and again prior to being put into the SPSS version 20.0 software. Once the data was entered in an Excel spreadsheet before being transferred to the SPSS software, the data was again checked for validity to insure number count was correct and had not be entered incorrectly. No hardware malfunctions occurred during the data collection period or during the analysis of the data by the SPSS software. Generalization of this project to other populations is valid. A larger population with a longer time frame would be beneficial to ensure external validity.

Methods of Evaluation

A quantitative research method was utilized to compare the relationship between data gathered pre-implementation and post-implementation of the EMR. Using SPSS Cronbach's Alpha, reliability of the pre-implementation data is .807 and post-implementation the reliability is .831; therefore, both pre and post implementation statistical data is reliable. During data collection, count was repeated to ensure accuracy of the count of appointments scheduled and appointments missed.

Quantitative data was used to draw inferences from the data collected pre and post implementation of the EMR using the SPSS version 20.0 software. A percentage analysis was configured and found that pre-implementation, 793 patients were scheduled for appointments with 727 showing for those appointments. The results was a no show rate of 66 patients which was 8.3% of the total scheduled (Figure 5). After implementation, 773 patients were scheduled with 679 showing for their appointment. This left a no show rate of 94 patients which was 12.1% of those scheduled for appointments (Table 6). The confidence interval for pre and post implementation was 95%. The t-test (pre-implementation) was $t = 2.9$ (Table 2). The t-test (post-implementation) ranged from 2.8 to 2.9 (Table 1). The sample size was small due to the minimal number of patients seen in the small rural clinic and due to the short time frame studied.

RESULTS

The project was implemented in a small rural community where the socioeconomic status is one of the poorest in the State of Texas. Clients who present to this clinic fall below 200% of the federal poverty level (FPL) and are uninsured. The clinic is funded by local, state, and federal entities; thus, the staff is minimal due to recent decreases in funding available to these type of clinics. There was no available staff to contact patients prior to an appointment by telephone or letter; therefore, the implementation of an EMR was deemed a possible advantageous asset to the clinic in that the built-in alert system would automatically alert patients to upcoming appointments. Thus, the goal was to increase appointment compliance through the EMR notification system.

The customization and the implementation of the EMR system was taken on by the DNP project leader as there was no funding to employ technical support at that time. Since implementation of the project, the clinic has hired an information technology person.

The key stakeholders included the DNP project leader, the Board of Directors of the clinic, the Administrator, the Medical Director, staff, and the patients (Figure 5). The customization and training of stakeholders was successful and an easy process as the individuals included were small in number. When the system went "live" on August 1, 2015, there were some issues that were handled on a daily basis such as flow of the chart note and working with the billing staff on the superbill. The success of inputting patients' e-mails and cell phone numbers into the system was ongoing as each patient updates an information data sheet at each visit. However, there were minimal (less than 1%) non-participation due to inability to receive e-mails or text messages. The staff found that the majority of patients now have smart phones and understand how to use them and would mark the box for text messages more often than sharing their e-mail address. Less than 5 patients did not wish to receive alerts via the electronic alert system through the personal patient portal out of 773 scheduled appointments post-implementation.

The project time frame was 3 months which is not a long enough period to determine patient/staff satisfaction, service utilization, and cost efficiency. As the staff continues to adjust to the use of the EMR system, it is anticipated that efficiency will increase and cost efficiency will increase due to the ability of the billing staff to retrieve data the day after the patient is seen rather than waiting for the superbill to go through multiple hands before finally reaching the billing clerk.

The benefits of the EMR system are ease of operation for the front desk staff. The flow of the clinic was impaired initially due to the learning curve regarding the use of templates and how to retrieve those templates. The staff continues to work on this four months into the process.

Failure of the EMR to provide the expected outcomes is evident in the percentages tabulated in the data analysis. The EMR was implemented in August when school is starting in the rural community and appointment numbers are normally down in that month; therefore, the failure could be contributed to the normal ebb and flow of appointment compliance within the clinic. As the EMR system was new to the staff and patients, the possibility of misunderstanding of how to interpret messages received could have been a negative factor.

DISCUSSION

Summary

The implementation of an EMR system was beneficial to the rural health clinic. The ease of data retrieval is an asset. However, the results were unexpected as the increase in percentages of no-show appointments after implementation was not the expected outcome. Failures of use by one provider did not affect the outcomes as only scheduled appointments and missed appointments were addressed. Future training for staff is important to the continued improvement of the use of the EMR.

The strength of the project was that data collected was from only two sources; therefore, the integrity of the data could be checked, and re-checked multiple times without difficulty. As only one person was working directly with the data collection, the chance of risk of privacy concerns was minimal.

Relation to Other Evidence

Financial barriers were found to be a concern with this project. Technical difficulties were a problem at some points in time due to the ever changing updates from the EMR system. Ajami and Arab-Chadegani (2013) found that barriers included cost constraints, standardization limits, technical limitations, and attitudes of end users. Barron and Manhas (2011) found that

further research is needed to show the value of implementation of an electronic health record (EHR). Another article by Bratan, Stramer, and Greenlaugh (2010) found that EMRs provide both risks and benefits. Technical challenges were found to be a risk factor in computerized decision support systems, as well, as some improvements in providers' performance in preventive care (Cresswell, Majeed, Bates, & Sheikh, 2012).

On a positive note, Finkelstein et al. (2013) reports that patients who use text messages or emails, and who are familiar with this type of technology are more likely to allow providers to use text messages or emails as alerts for upcoming appointments. Similarly, Saparovo (2012) found that the use of PHRs are important tools in motivating patients to adopt health behaviors associated with their own disease and medication management.

Limitations

Amount of individuals who actually opened email or text messages alerts may have been a limiting factor in the outcome. Internal validity in regards to design pre-implementation was pretty regimented with minimal variables to cause concern. The limiting factors post-implementation were more extensive as previously described.

External validity could be reproduced in a larger population in a different type setting with a more concise and valid population of study. The small area from which the population of the clinic resides along with the minimal number of patients could be a factor in the negative results to the project study.

The probability that observed losses might strengthen over time is greater than the projection of weakness due to the ability for the staff and patients to become more familiar with the EMR system. A longer period of study for the project would allow for time for the patients' to become familiar with how the system works and that the alert text is an important message to

note. A longer time frame would also establish familiarity with the personal patient portal for the patient. The ease of use over time for the staff would allow for easier transition and more time to educate the patient on how to respond to e-mails and alerts received.

The effect of the project limitations on results is evident due to the negative outcome of the notification process. More time is needed to determine if an EMR alert system would indeed contribute to improved appointment compliance by the patient.

Interpretation

Observed outcomes versus expected outcomes indicate that the EMR system is not influential in determining appointment compliance or the increase, thereof. A larger population over a longer span of time should be looked at in the future to determine if the expected outcomes would be different. The small population size in the rural setting along with the short time frame was detrimental to the negative outcome of decreased appointment compliance. In a population where money is a huge factor in keeping appointments, financial constraints may have played a large part in the failure of the expected outcomes.

Conclusions

The findings from this project increase the awareness of a needed method to help increase appointment compliance in the patient population in one small rural clinic. The implementation of EMR systems worldwide, especially in remote villages and rural areas reinforces the importance of needed knowledge related to the implementation of EMRs globally. However, this project indicates that further studies are needed to determine if the adoption of an EMR system and the implementation of such a system will make a difference on appointment compliance in rural areas.

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Table 1. One-Sample Test

Post-implementation	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Scheduled-Showed	2.999	3	.058	396.500	-24.25	817.25
Showed	2.999	3	.058	363.500	-22.26	749.26
No shows	2.926	3	.061	33.000	-2.89	68.89

Table 2. One-Sample Test

Pre-implementation	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Scheduled-Showed	2.986	3	.058	386.500	-25.44	798.44
Showed	2.992	3	.058	339.500	-21.64	700.64
No shows	2.898	3	.063	47.000	-4.61	98.61

Table 3. Descriptive Statistics

Pre-implementation	N Statistic	Minimum Statistic	Maximum Statistic	Mean Statistic	Std. Deviation Statistic	Skewness Statistic	Std. Error
ScheduledShow	4	259	793	396.50	264.422	1.996	1.014
Showed	4	233	727	363.50	242.429	1.995	1.014
No shows	4	15	66	33.00	22.554	1.700	1.014
Valid N (listwise)	4						

Table 4. Descriptive Statistics

Post-implemenation	N Statistic	Minimum Statistic	Maximum Statistic	Mean Statistic	Std. Deviation Statistic	Skewness Statistic	Std. Error
ScheduledShow	4	225	773	386.50	258.885	1.943	1.014
Showed	4	205	679	339.50	226.954	1.967	1.014
No shows	4	20	94	47.00	32.435	1.594	1.014
Valid N (listwise)	4						

Figure 5.
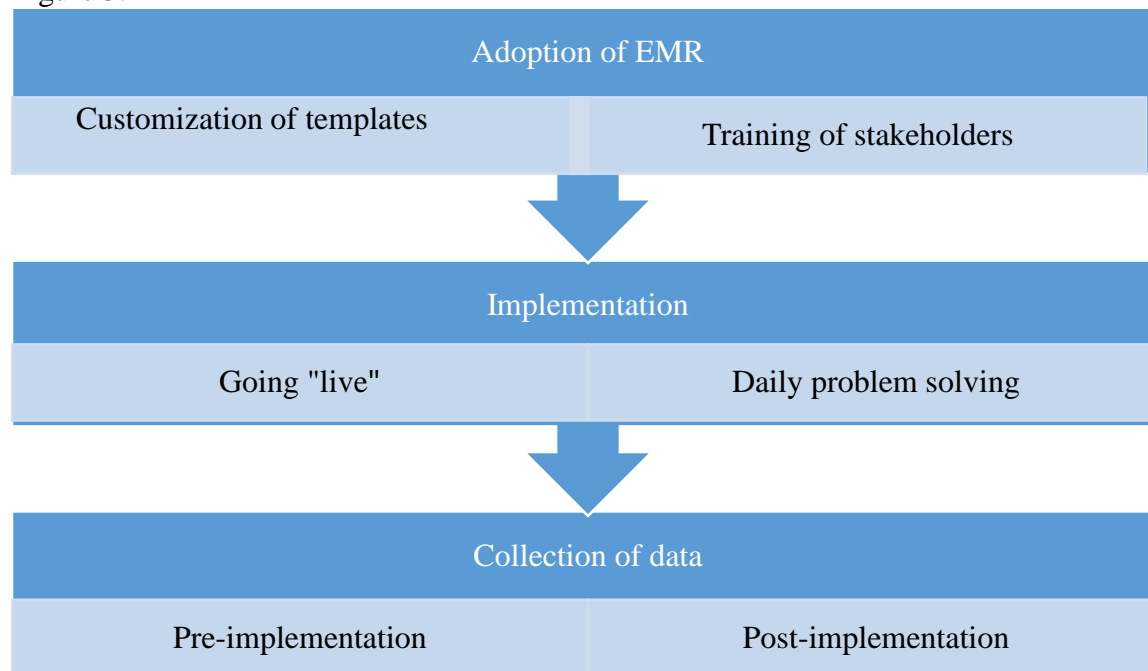
Table 6. Pre-implementation data collected from scheduling book.

MONTH	SCHEDULED	SHOWED	NO-SHOW	% of No-shows
May 2015	259	233	26	9.9%
June 2015	274	249	25	9.1%
July 2015	260	245	15	5.7%
TOTALS	793	727	66	8.3%

Table 7. Post-implementation of data collected from EMR.

Month	Scheduled	Showed	No-shows	% of No-shows
August 2015	262	228	34	12.9%
September 2015	286	246	40	13.9%
October 2015	225	205	20	8.8%
TOTALS	773	679	94	12.1%

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Capella University's Academic Honesty Policy (3.01.01) holds learners accountable for the integrity of work they submit, which includes but is not limited to discussion postings, assignments, comprehensive exams, and the dissertation or capstone project.

Established in the Policy are the expectations for original work, rationale for the policy, definition of terms that pertain to academic honesty and original work, and disciplinary consequences of academic dishonesty. Also stated in the Policy is the expectation that learners will follow APA rules for citing another person's ideas or works.

The following standards for original work and definition of *plagiarism* are discussed in the Policy:

> Learners are expected to be the sole authors of their work and to acknowledge the authorship of others' work through proper citation and reference. Use of another person's ideas, including another learner's, without proper reference or citation constitutes plagiarism and academic dishonesty and is prohibited conduct. (p. 1)

> Plagiarism is one example of academic dishonesty. Plagiarism is presenting someone else's ideas or work as your own. Plagiarism also includes copying verbatim or rephrasing ideas without properly acknowledging the source by author, date, and publication medium. (p. 2)

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Statement of Original Work and Signature

I have read, understood, and abided by Capella University's Academic Honesty Policy (3.01.01) and Research Misconduct Policy (3.03.06), including the Policy Statements, Rationale, and Definitions.

I attest that this dissertation or capstone project is my own work. Where I have used the ideas or words of others, I have paraphrased, summarized, or used direct quotes following the guidelines set forth in the APA *Publication Manual*.

Learner name and date	Nadia Martindale, 11-7-2015
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