Enhancing Readiness to Support EHR Transition in an Outpatient Clinic

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Abstract

Solo private physician-owned clinics report lower rates of electronic health record (EHR) use. Lack of use of an EHR results in billing penalties, revenue losses, and may affect quality of care. An EHR provides a concise recollection of a patient's complete medical history, and any pertinent exam information clearly and succinctly. The aim of this pilot project was to support a small solo private physician-owned clinic transition from paper-based charting to an EHR. The pilot assessed through a validated survey EHR readiness and confidence of the employees at the beginning of the change process (pre-intervention) and at 16 weeks (post-intervention). During the 16-weeks, interventions in the form of transition assistance included vetting an EHR modality for the practice, virtual training via EHR modules, weekly check-ins with stakeholders, and organizational planning and scheduling with staff. EMR-based goal setting with EHR rollout deadlines was also provided. Results noted confidence decreased pertaining to EHR transitioning over the 16 weeks. Unforeseen barriers and challenges likely led to reduced confidence and provided information on future transition supports needed for the practice. The findings of this pilot are beneficial in gaining insight on how to enhance readiness in an outpatient clinic for EHR readiness. This information is utilized as a guide for small privately-owned outpatient clinics in their organizational transition from paper-charting to EHR. The results of this pilot project provide evidence-based data on the demands of system-wide organizational change.

Keywords: electronic health records, organizational readiness, EHR transition

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Federal initiatives to transition public and private health care providers to electronic medical records (EHR) as part of the American Recovery and Reinvestment Act by January 1st, 2014 to maintain their existing Medicaid and Medicare levels of reimbursement have been in legislative effect (Kruse et al., 2016). Part of this national initiative provided monetary initiatives to transition to EHR. The initiative focuses on improving communication between clinicians, providing effective sharing of protected medical records, improved management of patient medical records lowering health care costs, and improving the overall quality of care (Kruse et al., 2016). Failure to transition by January 1st, 2014, resulted in penalties to the level of billing Medicaid and Medicare patients, as well as a fine. Small private physician offices face challenges to meet these Medicare initiatives. Those challenges include transitioning to an EHR platform, penalization with monetary fines, failure to recoup revenue, and limited means to recruit assistance in the conversion of paper-based charting to the EHR. The purpose of this manuscript is to review the results of a doctoral-level project aimed at supporting the EHR transition of a small private physician's office.

Problem Statement

According to the Health IT Dashboard, as of 2017, 9 out of 10 office-based physicians have adopted a form of EHR, or 86% across the nation (The Office of the National Coordinator for Health Information Technology [Health IT], 2019). According to the latest Arizona Health Care Cost Containment System report from May 24th, 2019, only 74.3% of EHR is utilized by physician-owned solo practices, among the lowest utilizers of EHR technology (Arizona State Medicaid Health Information Technology Plan, 2019). In comparison, physicians in hospice, skilled nursing facilities, mental health, and independent contractors have the highest utilization

rates at 100% (Arizona State Medicaid Health Information Technology Plan, 2019). The

maximization of EHR transition, utilization, and capability is significant as providers can qualify

for meaningful usage incentives of monetary value. The failure to successfully transition to EHR

results in lower Medicare and Medicaid reimbursement rates, perpetuating a cycle of lost

revenue, lack of primary income to invest in an EHR, ultimately resulting in the inability to

contribute meaningfully to practice improvements (Zhang et al., 2016).

Purpose and Rationale

The lack of EHR implementation in Arizona in solo private physician-owned clinics, is lower

than the national average of single private physician-owned clinics across the United States

(Health IT, 2019). The implementation of EHR is crucial in providing a systematic concise

recollection of a patient's medical history, medication orders, allergies, vital sign trends,

laboratory results, diagnostic reports, and any pertinent exam information clearly and succinctly.

A meta-analysis provided evidence that an EHR can improve the quality of health care delivery,

increasing efficacy, and simultaneously decreasing medication errors and improve guideline

adherence for safe practice (Campanella et al., 2015). To improve EHR transition in a single

private physician-owned clinic, the author conducted a pilot project aimed at enhancing

readiness and confidence among employees of an outpatient clinic transitioning from paper-

based charting to an EHR.

Background and Significance

Private Owned Primary Care Clinic

Nationwide, the majority of patients (65%) seek care from small practice primary care

clinics. However, these smaller practices (one to 10 providers) have twice the chance of non-

adherence to implement an EHR system. Less than 2% of solo and two physician-only practices

have adapted to EHR delivery systems, stating financial barriers to transitioning to EHR (Zhang

et al., 2016). The financial implications related to non-adherence to transitioning to EHR

includes financial limitations in Medicare and Medicaid reimbursements. Medicare and

Medicaid reimbursements are based on a scale, and offices that are not utilizing EHRs are

reimbursed at a lower rate.

In addition to the monetary benefits of transitioning from paper health records to EHRs,

clinics will be in compliance with the American Recovery and Reinvestment Act. The American

Recovery and Reinvestment Act was passed in 2009 to help stimulate the economy by upgrading

technology for public safety agencies such as primary care clinics to support an EHR. This

ultimately increases the quality of health care delivery. Health information technology (HIT)

focus on reducing overall costs of health care delivery and compliance with federal regulations.

This transition to EHR requires significant capital investment into equipment upgrades, software,

maintenance, training for staff, and changes in leadership or governance (Mason et al., 2017).

These individual factors contribute to the complexity of transitioning to EHR. Ultimately, these

factors lead to doubt in health care providers in transitioning since there is no guarantee of

investments worth the time or money that is required.

A systematic review identified advantages of EHR implementation through interviews

and observations of 14 primary care physicians in the Southern United States. The benefits are as

follows: the ability of multiple health care providers to access records, increased legibility of

documents and completeness, increased organization of patient data, overall decreased time in

documentation, improved communication within the clinic, and improved quality of patient care

(Holroyd-Leduc et al., 2011). In addition to these benefits, a meta-analysis provides

monumental evidence that EHR utilization can impact patient outcomes via guideline adherence.

Adhering to best evidence-based practice, such as guidelines, can reduce costs of care, support

clinicians in their practice choices by limiting errors, and reduce waste of resources related to the

course of treatment (Campanella et al., 2015). Providing excellent care in a systematic and

accurate format such as an EHR contributes to the quality of care primary care clinics can

provide effectively.

Through extensive searching in identifying possible barriers to overcome when

transitioning to EHR there were several similarities and themes. The themes identified while

reviewing current data is that the barriers ultimately entail costs of transitioning and maintenance

of an electronic system, fear of interruption of workflow, and inability to cope with changes

(Helfrich et al., 2018; Zhang et al., 2016). The positive changes of transitioning to EHR are

another overwhelming theme throughout researching the significance. These details will be

discussed further as the progression of the importance of transitioning to EHR in relation to

paper charting is impacted with large organizational change.

Transitioning to Electronic Health Record

The primary purpose of EHRs is to provide evidence-based health care, increase

complete patient care planning, accuracy in inpatient health history, the validity of patient care,

and coordinated access to all clinicians, and safer prescribing practices (Alsadi & Saleh, 2019).

This transition does not come without disruption in the workflow for the clinic during the

implementation. To estimate the efficacy of implementing an EHR transition, an assessment of

readiness for change on an organization level as well as staff-level of acceptance is pertinent.

Organizational readiness is the detriment of the success of any change. Helfrich et al. (2018)

identified five readiness factors in a small low wage worksite: favorable broader conditions,

valuing health promotion, resources and demands to implement health promotion, intentions to

achieving health promotion, and efficacy of change over time. The study showed that the trial with interventions to coordinate implementation and support showed significantly higher change compliance in wellness programs (Helfrich et al., 2018). This supports the need for assessing readiness and supporting staff and leadership through the change to transition to EHR successfully.

Paper Charting

In an observational, cross-sectional comparative study of 600 randomized medical records were reviewed systematically in a deliberate search for medical errors in prescribing practices. The results yielded that 229 medical prescribing mistakes were found in paper charting methods, compared to 74 in electronic-based means (Hinojosa-Amaya et al., 2016). In contrast, a data quality review on patients enrolled in a Tuberculosis treatment program found fewer instances of quality data issues in digital records than corresponding paper-based records in care planning (Ali et al., 2018). Paper charting increases the risk of errors in medication, incomplete patient care plans, and treatment regimens.

Impact of Organizational Change

In a pilot study utilizing electronic medical records in quality improvement of prescribing safety, results substantiated the direct correlation in patient safety with EHR. The study concluded that EHR data could be used to safely provide standardized, reproducible reports that show quality improvements that impact patient care directly and increase safety in electronic prescribing (Booth et al., 2019). Patient safety and safe prescribing methods are only one positive impact on organizational change towards transitioning to EHR. Among another overlooked positive influence of EHR transition is patient empowerment.

With the emergence of EHR, patients can access more of their medical data and diagnostic test results within a matter of moments. A lot of the EHR benefits have to do with the effectiveness of health care providers; however, it also increases patient empowerment in care. A patient's role is now transitioning from a patient who is guided about their health status to a patient who is well informed and can take advocacy in their health care. In a systematic review of patient empowerment trends, compared to paper-based access to records, patients express improved relationships with practitioners and suggest the ability to access health information as useful and productive (Ammenwerth et al., 2011). Transitioning to electronic-based medical records is imperative to support current guidelines, increase patient safety, keep accurate and valid records of ongoing care, decrease the amount of time searching for pertinent information, and empower patients to play a larger role in their health care management.

Internal Evidence

A small primary care clinic in the Southwest, privately owned by two physicians that provide care for geriatric populations, was examined and found to be lacking appropriate electronic-based patient medical records. The population of this primary care clinic is mainly geriatric, as thus, their medical records can be lengthy. The sheer number of data in these charts is overwhelming and leads to an incomplete picture of the patient's medical history. The legibility of patient charts is limited to the provider dictating in them, and an incomplete narrative note of what type of care prescribed and what the plan is moving forward. Since this primary care clinic has been utilizing paper charting for over 40 years, there is global resistance to transitioning to EHR by one physician that owns the clinic, as well as the support staff (two medical assistants, an office manager, and two front office staff). Although this primary care

clinic has been cohesively functioning with paper charting, there is room for improvement in both patient care delivery and consistency in medical records.

PICOT Question

Health care delivery systems require change and adaptation to stay current, consistent, and improve quality of care. Identifying unique barriers can help construct complex process improvement plans specific to each health care organization's needs. Process improvement strategies require the initial step of identifying first the need for change. This inquiry has led to the clinically relevant PICOT question, "In a privately-owned primary care clinic, how does identifying Electronic Health Record (EHR) transition barriers, compared to paper medical record charting barriers, effect motivation for organizational change within the next 12 weeks?"

Search Strategy

A detailed and thorough review of current evidence took place to answer the PICOT question. Three databases were used to acquire articles for background and significance of identifying barriers: CINAHL, PubMed (MEDLINE Complete), Cochrane, and library databases. The identification of research articles for research based on their relevance was reviewed regarding barriers to transitioning to EHR. In order to achieve the desired articles, similar terms in conjunction with utilizing advanced searching were used to procure articles that may fit the criteria. Utilizing similar terms with each search system allowed a cohesive retrieval of potential studies and or articles.

CINAHL

Utilizing "electronic medical record" and adding "primary care" to search terms yielded initially over 3,027 results. Limiting it to studies or articles from 2010 to 2019 brought that number down to 2,701. Adding the search phrase "barriers" and "challenges" yielded 241 final

studies. The inclusion criteria initially were either systematic reviews, meta-analysis, randomized controlled trials (RCT), cross sectional, and observational studies. Exclusion criteria were anything not meeting these search terms. The combination of words used were electronic medical record, health information technology and/or barriers as it relates directly to the background and significance of transitioning to EHR.

PubMed

Utilizing "electronic health records" and "primary care" and "safety" helped narrow articles down to 852. This was crucial in finding articles that pertain to EHR in the primary care setting that also related to safety. This purpose was to find articles that may have conducted RCTs for safety in utilizing EHR. The inclusion criteria included systematic reviews, meta-analysis, and RCTs . Exclusion criteria were articles that did not pertain to patient safety, as well as anything outside of the search terms. Adding the term "barrier" or "challenges" to the advanced search yielded a final 72 studies.

Cochrane

Utilizing terms such as "technology" and "primary care clinic" and "barriers" in the control trials yielded three studies. This was unhelpful; therefore, a revision of search terms was completed to include "primary care" and "barriers," which yielded 32 studies. Narrowing the search further to limiting the time frame to less than five years yielded ten final potential studies and included randomized controlled trials that pertain to EHR transitions. Several studies were deemed not helpful as exclusion criteria were qualitative after-visit summaries of patients. This did not add to the significance and background of identifying barriers. The inclusion criteria were randomized controlled trials that compared paper charting to electronic charting, or qualitative studies on the barriers of transitioning.

Critical Appraisal & Synthesis of Evidence

The Melnyk and Fineout-Overholt's (2019) rapid critical appraisal tool was utilized to evaluate the quality of the final ten articles. The majority of these studies were higher level evidence. In Appendix A, an evaluation table was utilized to review study purpose, level of study, and overall findings (see Appendix A, Table A2). The commonalities of these studies showed that smaller private practices are more hesitant to transition to EHR due to financial barriers, than larger practices or acute care settings. One study showed that a measurement tool to assess the readiness of a practice to transition is helpful in identifying these barriers (Yusif et al., 2017). The studies indicate that barriers to transitioning are present, however, the overall outcomes of increased patient safety, prescribing, and decreasing medical charting errors speaks volume (see Appendix A, Table A2). The differences shown in the studies are the practice settings and different phases of transitioning to EHR. The literature review also revealed that having an EHR can alleviate workload and lead to higher levels of patient satisfaction and overall efficiency in workflow when implemented correctly.

Conclusions and Discussions

Transitioning to EHR is crucial to overcoming charting errors, increasing patient satisfaction, and increasing primary revenue. The evidence indicates that the sooner a practice complies with current EHR standards, the standard workflow will decrease over time with the ability to utilize services, such as scribes, to help chart efficacy. The data reviewed indicated that patient satisfaction, as well as safe prescribing methods, increase when utilizing an EHR. Continuing to utilize paper charting positions providers at a disadvantage in providing cross-communication between acute care settings and primary care settings. Ineffective

communication leads to increased medical errors and incomplete standards of care for patients, which in turn can lead to patient mortality.

Theory Application

Conceptual models and theories provide useful tools to provide an in-depth understanding of complex and abstract ideas. The conceptual framework used to explain the evidence and underpinning of identifying barriers to transitioning to EHR was the Theory of Transitions (see Appendix B, Figure 1). The Theory of Transitions is a middle-range theory that is used to identify that change and difference are not synonymous with transition (Smith & Liehr, 2014). The Theory of Transitions can be applied in various nursing research as it applies to daily lives, meanings, and processes of which transitions are experienced. Theory of Transitions can guide health care systems to overcome barriers to their unique diversity and complexity to create organizational level change, such as EHR implementation. In the Theory of Transitions (see Appendix B, Figure 1), the evidence guides the changes from the nature of transitioning to the transition conditions in the hope of receiving a pattern of response. This model was utilized in designing the pilot questionnaire to capture the patterns of confidence levels in EHR transitions.

Implementation Framework

The Continuous Quality Improvement (CQI) model is a quality management process that encourages health care providers to continuously internalize questions to improve system processes (see Appendix B, Figure 2). The continuous cycle includes four steps: structure, process, output, and outcome, leading back to CQI initiatives. This process was selected to guide this project as it is a continuous process that allows for frequent assessment of the efficacy of strategies. The first step is to identify the structure in which technology or EHR transition and barriers are the initial concerns. Step two is the process, gathering details and information on

who, how, what, and when of identifying barriers to EHR transitioning. Step three is the output,

or the workflow and actual utilization of interviewing staff about perceived barriers to

transitioning to EHR. The final outcome leads right back to CQI, as that information will be

disseminated and applied to proper implementation of actual organizational changes towards

EHR and beginning the CQI cycle again.

Implications for Practice Change

Transitioning to EHR to comply with federal regulations and improve practice outcomes

is needed for small, independently owned primary care clinics. The potential plan towards

practice changes is first developing a qualitative instrument to measure the perceived barriers to

transitioning to EHR as evidence shows that identifying barriers can measure levels of readiness

for change. Once soft data is accumulated, the areas of concern can be addressed individually

through research and meetings with the independent providers to review the responses. This

compiled information is crucial in continuing to move towards practice changes for this specific

primary care clinic. The information shall include prices initially to convert current technology in

the office, the projected time needed to roll out EHR from paper charting, and identifying

barriers to billing and time and resources in training current staff on the new EHR. This process

is crucial in identifying specific barriers for the intended primary care clinic.

Potential Outcomes

Potential positive outcomes for independently owned primary care clinics are identifying

individual themes that evidence has guided in perceived barriers such as money required, fears of

inadequate training, and time involved in transitioning. If the information gathered from the

initial surveying of the primary care clinic is utilized appropriately, an individualized plan may

be developed to move forward in transitioning to EHR. Each practice is unique in challenges,

and complexities. Researching what each clinic needs to support this organizational change is unsurmountable in the success of transitioning. The implications of this project proposal come with barriers such as potential push back or hesitation from the clinic to participate. The primary care clinic consists of two individual providers, and both have to agree on this change to start evolving. If the clinic does decide to participate, the entire practice will be involved in organizational change that affects current health care practices, patient safety, and workflow improvement.

Methods

In an effort to maintain workflow improvement, increase patient safety, and implement changes in current health care practices, the implementation of an EHR was initiated in a single physician-owned private practice. EHR transition support was provided by the author, and EHR confidence was measured in two phases: a pre-survey before the transition and a second phase in the late stages of full EHR transition. Evaluation at each stage was critical in gathering data to gauge whether the staff members were comfortable with the EHR and identifying areas where additional training was required.

Ethical Considerations

Approval from the Arizona State University Institutional Review Board (see Appendix E) was received, and the 12-week project measuring confidence levels in EHR implementation was initiated. Human subject protection was maintained by utilizing privacy and confidentiality during the surveying process. A unique link to a Question Pro survey provided anonymous access to the survey and included informed consent (see Appendix F). The primary researcher solely had access to the data results, which were collated electronically, and no identifying

participant data was collected. There were no foreseeable risks, discomforts, or inconveniences related to participation in the pilot.

Population and Setting

The pilot project was conducted in a solo, privately owned primary care clinic in Southwest Arizona. The clinic has two physician providers, a nurse practitioner, clinical support staff, and an office manager. Inclusion criteria consisted of participants age 18 years or older, able to speak, understand, and read English, and be an employee of the privately-owned primary care clinic.

Objectives

The pilot aimed to determine the confidence level of the staff at the solo, privately-owned primary care clinic before EHR implementation, and after receiving transition assistance by the author for 16-weeks. The system changes from paper-charting to EHR contain many facets and barriers therefore, the author focused on the confidence levels of the practice employees pre and post system change. The expected impact of confidence levels regarding EHR related to post-intervention is expected to increase. Meaning the levels of confidence surrounding EHR should be higher than confidence levels prior to EHR implementation. The knowledge obtained from this survey can be utilized in future change processes in this solo privately-owned primary care clinic as they continue through the transition.

Project Description

EHR confidence levels were measured in two phases: a pre-survey of confidence before the transition to EHR and a second phase in live utilization of EHR was measured with a post-confidence scale 16 weeks after. During the 16-weeks, the author provided transition assistance in the form of several interventions, including virtual training via EHR modules, weekly check-

ins with stakeholders via zoom, and organizational planning and scheduling with the office

manager. The author also supported EMR-based goal setting with the office manager to meet

EHR rollout deadlines, advisement on paper charting conversion in manageable phases, patient

chart auditing, scanning, and data entry into EHR. The author also participated in meetings

coordinating EHR representatives and different EHR modalities during the 16 weeks.

Participants received a recruitment email with a link to an anonymous two-time 23 question

survey designed by Stratus Health (see Appendix D), and an informed consent (see Appendix E).

Initial surveys were sent out on October 9th, 2020, a follow-up zoom voice call was completed on

October 16th, 2020, to remind staff to complete surveys. Final pre-surveys were collected the

following week, October 23rd, 2020. The final post-survey was sent out 16 weeks after the last

collection date, on February 12th, 2021. The researcher followed up on February 19th via zoom

voice call to remind staff of the survey. Final surveys were completed on February 26th, 2021.

Instrumentation

Participants received a recruitment email with a link to an anonymous two-time 23

question survey designed by Stratus Health (see Appendix D). The survey included three

demographic questions pertaining to previous experience with EHR, role in the outpatient clinic

(management, clinical, administrative, medical assistant, lab technician, volunteer, information

technology), and length of time being in indicated role. The 20 Stratus Health Survey questions

rated confidence in EHR on a Likert scale of 1 being not yet prepared, 2 moderately prepared,

and 3 highly prepared for EHR transition through planning processes, involvement, executive

team decision making, staffing needs, policies, procedures, and protocols, referrals and client

involvement. The survey used does not have established validity and reliability indices; however,

the tool was used effectively in the Minnesota statewide EHR transition initiative 10 years ago.

The survey was programmed utilizing *Question Pro,* software available for use by Arizona State University that is secure and allows for anonymous surveying for researching purposes.

Data Collection and Analysis

All data was solely collected and stored by the author. Data collection occurred twice, once at the beginning of the pilot and 16-weeks later. The same survey was utilized pre and post-intervention. Data collection included three demographic questions regarding previous experiences with EHR, years in current health care role, and which role in the clinic participants were performing, and 20 questions assessing EHR readiness in four domains (culture of the organization, leadership and management, operations, and workflow process improvement) that were evaluated using a three-point Likert scale ('not yet prepared', 'moderately prepared' and 'highly prepared'). All data was downloaded from *Question Pro* into a Microsoft Excel spreadsheet and then uploaded into Intellectus Statistics™ software. Three checks were performed for accuracy. Data analysis began with the evaluation of missing data; none were found. Descriptive statistics were used to analyze demographic and survey results. The crosstabulation of time analysis for the pretest (survey just prior to the intervention) and posttest (survey post-intervention, 16 weeks later) was conducted to examine the median confidence score between the two points in time.

Budget

The budget was determined by the owner of the private primary care clinic for the EHR transition, although a limit was not discussed. The cost breakdown (see Appendix C) utilizes two new scanners for patient charts, Wi-fi extenders for the office equipment, Windows 10 upgrade, EHR monthly subscription and hard drives for patient charts. The total overhead initial charge was approximately $7,020 without tax for the practice. The revenue loss provided by the office

manager totaled to $1,835.00 in fees alone for not utilizing EHR. The full implementation of

EHR will increase revenue and yield a $500.00 monthly savings.

Results

A descriptive analysis was done with crosstabulation of time (pretest and posttest) as a

result of the sample size collected was too small to complete an independent variable T-test or

freedman test. The results were first analyzed for reliability via a confidence scale of questions 1-

20. The confidence items had a Cronbach's alpha coefficient of 0.91, which indicates excellent

reliability (see Appendix G, Table 3). For the pretest (pre-intervention), the observation of

confidence mean was 2.29 (see Appendix G, Table 2). For the posttest (post-intervention), the

observation of confidence mean was 1.58 (see Appendix G, Table 4). The number of pre-

intervention surveys completed was four and post-intervention was two. The most frequently

observed category of demographic question one was "Yes" (n=5, 83%) in having experience

with EHR previously. The most frequently observed category for demographic question two

which was role was clinical and medical assistant, with an observed frequency of 2 (33%). The

most frequently observed category related to the length of time in role was 1-3 years (n=3, 50%).

Observations made from pretest to posttest is that confidence levels decreased over time (see

Appendix G, Figure 1).

The clinical significance of the results is that over time confidence level in EHR

transition decreased. The impact of this data observed is that EHR transition requires time,

energy, money, and employees to be on board with transitioning and paper chart conversion to

EHR. Over the course of 16 weeks the confidence level decreased as challenges and barriers to

meet deadlines and transferring patient data increased. Patient data were entered as patient charts

were dictated due to time constraints of the practice and providers. This created a lag in time

management and resources. These factors contributed to a decrease in confidence in EHR

transition.

Project impacts were predominantly noted among staff which indirectly affected patients

and the broader system. In the process of EMR transition, unforeseen barriers and time

constraints placed more significant challenges on staff, resulting in reduced confidence and

transition delays. With delays, patient care was affected since the staff had competing demands

attending to patient needs while attempting to transition. As a result, the entire system felt slower

and less efficient. The author's intervention assisted with the barriers and challenges which

helped the system ultimately "go live" with the EHR. As an outcome, the practice realized that

continued practice support interventions from another human resource is needed. This pilot

project will be sustained by another student who plans to continue the support for the practice via

chart review, paper chart conversion, and patient data entry, which is expected to increase

confidence levels in their EHR transition. This author's interventions during this pilot study,

such as paper chart mitigation, auditing, patient health records scanning, and weekly meetings

with project champion, led to EHR role out and was a catalyst for transitioning to EHR.

Discussion

Summary

This pilot project measuring the confidence scale of employees of an outpatient clinic

before and after implementing an EHR underwent a measurable outcome of personal confidence

of EHR. The observation made by the author during the 16 week intervention period, which is

supported by descriptive analysis of confidence surveys, is that confidence overall decreased

over time pertaining to EHR transitioning. The findings of this observation are in relationship to

the confidence of the staff before transitioning and after. A decrease in confidence coincides with

the amount of tasks during EHR transition that lowers the confidence rating overall in an outpatient clinic. The observation noted by this author in the pilot study is that there is a dire need for more support during the EHR transitioning phase. Another noted response is that the current EHR that has been selected may not be an appropriate fit for the primary care outpatient clinic.

Limitations, Barriers and Challenges

There are several barriers and limitations of this study that are notable. One limitation includes the 16 weeks of interventions of scanning, chart audit, paper chart mitigations, and lack of outside support (aside from this author) in the initial transitioning to EHR. The barriers encountered included time constraints, human resources to help alleviate transitional barriers such as patient data entry, chart organization, and conversion to EHR. The lack of support contributed to missing timeline goals and deadlines to transition patient health information adequately. Another barrier is the small sample size of surveys that were returned to the author. This created a barrier in adequately assessing the confidence levels of the entire practice.

Findings in Literature

In a time-motion study conducted in an emergency department that was transitioning to EHR, the results showed a decrease in time spent with patients and an increase in time spent navigating the chart, reviewing records, and physician flow in efficacy (Calder-Sprackman et al., 2021). The results of this study were surprising as it coincides with this author's pilot study and decrease in staff confidence in an outpatient clinic as EHR rollout and implementation went "live." The literature supports that provider's fear of efficiency was sustained during the post-implementation period, and workflow changes continued to decrease in efficacy during the adoption of new EHR systems (Calder-Sprackman et al., 2021). This author observed the

cohesiveness in data from the time-motion study and this pilot project. The data and literature align as provider confidence decreases due to time constraints, barriers in hiring human resources, and an overall decrease in provider and practice efficacy.

Recommendations for Further Study

This author recommends that interventions that were completed during the 16 weeks of implementation, including paper chart conversion, patient data entry, and chart review to be continued in order to sustain changes system-wide and on an organizational level. Additionally, this author recommends further expansion of the study and continuing previously notated interventions to sustain change and increase confidence in this outpatient clinic during the transition to EHR. Further recommendations for study include another researcher conducting a study on the sustainability of confidence and change during the roll out of EHR in an outpatient clinic.

Conclusion

In conclusion, this author noted that a small private physician office faces multiple challenges to meet Medicare initiatives set by the federal government. These challenges include transitioning to an EHR modality, penalization with monetary fines, failure to recoup revenue loss, and limited means to recruit assistance in the conversion of paper-based charting to an EHR modality. The purpose of this manuscript is to review the results of a doctoral-level project aimed at supporting the EHR transition of a small private physician's office. This author concludes that the overall confidence in EHR transitioning was decreased as a direct result of having limited hands on resources to help with transitioning to EHR. Furthermore, this author observed the stress that the current chosen EHR has implicated. This author concludes that an

additional EHR modality needs to be explored with the inclusion of extra human resources to

sustain changes in EHR transitioning.

References

Ali, S. M., Naureen, F., Noor, A., Kamel Boulos, M. N., Aamir, J., Ishaq, M., Anjum, N.,

Ainsworth, J., Rashid, A., Majidulla, A., & Fatima, I. (2018). Data quality: A negotiator

between paper-based and digital records in Pakistan's TB control program. *MDPI*, *3*(27),

1–16. https://doi.org/10.3390/data3030027

Alsadi, M., & Saleh, A. (2019). Electronic health records implementation readiness: An

integrative review. *Scientific Research Publishing*, *9*, 152–162.

https://doi.org/10.4236/ojn.2019.92014

Ammenwerth, E., Schnell-Inderst, P., & Hoerbst, A. (2011). Patient empowerment by electronic

health records: First results of a systematic review on the benefit of patient portals.

Institute for Health Information Systems, *165*, 63–67. https://doi.org/10.3233/978-1-

60750-735-2-63

Arizona State Medicaid Health Information Technology Plan. (2019). *Arizona Health Care Cost

Containment System* (May 24, 2019) [Report]. AHCCCS.

https://doi.org/https://www.azahcccs.gov/AHCCCS/Downloads/Plans/2019AZSMHPVer

sion90.pdf

Arizona State Medicaid Health Information Technology Plan. (2019). *Arizona Health Care Cost

Containment System* (May 24, 2019) [Report]. AHCCCS.

https://doi.org/https://www.azahcccs.gov/AHCCCS/Downloads/Plans/2019AZSMHPVer

sion90.pdfBadowski, D., Horsley, T. L., Rossler, K. L., & Mariani, B. (2018). Electronic

charting during simulation. *Wolters Kluwer Health*.

https://doi.org/10.1097/CIN.0000000000000457

Booth, H. P., Gallagher, A. M., Mullett, D., Carty, L., Padmanabhan, S., Myles, P. R., Welburn, S. J., Hoghton, M., Rafi, I., & Valentine, J. (2019). Quality improvement of prescribing safety: A pilot study in primary care using UK electronic health records. *British Journal of General Practice*. https://doi.org/10.3399/bjgp19x704597

Calder-Sprackman, S., Clapham, G., Kandiah, T., Choo-Foo, J., Aggarwal, S., Sweet, J., Abdulkarim, K., Price, C., Thiruganasambandamoorthy, V., & Kwok, E. S. (2021). The impact of adoption of an electronic health record on emergency physician work: A time motion study. *Journal of the American College of Emergency Physicians Open*, *2*(1). https://doi.org/10.1002/emp2.12362

Campanella, P., Lovato, E., Marone, C., Fallacara, L., Mancuso, A., Ricciardi, W., & Specchia, M. L. (2015). The impact of electronic health records on health care quality: A systematic review and meta-analysis. *European Journal of Public Health*, *26*(1), 60–64. https://doi.org/10.1093/eurpub/ckv122

Elliot, R. A., Lee, C. Y., & Hussainy, S. Y. (2016). Evaluation of a hybrid paper-electronic medication management system at a residential aged care facility. *Health Service Research*, *40*, 244–250. https://doi.org/10.1071/AH14206

Gidwani, R., Nguyen, C., Kofoed, A., Carragee, C., Rydel, T., Nellingan, I., Sattler, A., Mahoney, M., & Lim, S. (2017). Impact of scribes on physician satisfaction, patient satisfaction, and charting efficiency. *Annals of Family Medicine*, *15*(5). www.annfammed.org

Gulliford, M. C., Staa, T. Van, Dregon, A., McDermott, L., McCann, G., Ashworth, M., Charlton, J., Little, P., Moore, M. V., & Yardley, L. (2014). Electronic health records for

intervention research: A cluster randomized trial to reduce antibiotic prescribing in primary care. *Analls of Family Medicine*, *12*(4). www.annfammed.org

Helfrich, C. D., Kohn, M. J., Stapleton, A., Allen, C. L., Hammerback, K. E., Chan, K. G., Parrish, A. T., Ryan, D. E., Weiner, B. J., Harris, J. R., & Hannon, P. A. (2018). Readiness to change over time: Change commitment and change efficacy in a workplace health-promotion trial. *Frontiers in Public Health*, *6*, Article 110. https://doi.org/10.3389/fpubh.2018.00110

Hinojosa-Amaya, J. M., Rodriguez-Garcia, F. G., Yeverino-Castro, S. G., Sanchez-Cardenas, M., Villarreal-Alarcon, M. A., & Galarza-Delgado, D. A. (2016). Medication errors: Electronic vs paper-based prescribing. Experience at a tertiary care university hospital. *Journal of Evaluation in Clinical Practice*, *22*(5), 751–754. https://doi.org/10.1111/jep.12535

Holroyd-Leduc, J. M., Lorenzetti, D., Stratus, S. E., Sykes, L., & Quan, H. (2011). The impact of the electronic medical record on structure, process, and outcomes within primary care: A systematic review of the evidence. *Journal of the American Medical Informatics Association*, *18*(6), Article 732-737. https://doi.org/10.1136/amiajnl-2010-000019

Mack, D., Zhang, S., Douglas, M., Sow, C., & Strothers, H. (2016). Disparities in primary care EHR adoption rates. *Journal of Health Care for the Poor and Underserved*, *27*(1), 327–338. https://doi.org/10.1353/hpu.2016.0005

Mason, P., Mayer, R., Chien, W.-W., & Monestime, J. P. (2017). Overcoming barriers to implementing electronic health records in rural primary care clinics. *The Qualitative Report*, *22*(11), 2943–2955. https://nsuworks.nova.edu/tqr/vol22/iss11/7

Melnyk, B. M., & Finest-Overholt, E. (2019). *Evidence-Based Practice in Nursing and Healthcare* (4th ed.). Wolters Kluwer.

Price, M., Davies, I., Rusk, R., Lesperance, M., & Weber, J. (2017). Applying STOPP guidelines in primary care through electronic medical record decision support: Randomized control trial highlighting the importance of data quality. *Journal of Informatics Research Medical Informatics*, *5*(2). https://doi.org/10.2196/medinform.6226

Smith, M. J., & Liehr, P. R. (2014). *Middle Range Theory for Nursing* (3rd ed.). Springer Publishing Company.

The National Learning Consortium. (2013). *Continuous quality improvement (CQI) strategies to optimize your practice* (April 30, 2013) [Technology Support]. Health Information Technology Research Center .

https://www.healthit.gov/sites/default/files/tools/nlc_continuousqualityimprovementprimer.pdf

The Office of the National Coordinator for Health Information Technology. (2019). *Office-based Physican Electronic Health Record Adoption* (2017) [Quick-Stat].

https://doi.org/https://dashboard.healthit.gov/quickstats/pages/physician-ehr-adoption-trends.php

Warren, L. R., Clarke, J., Arora, S., & Darzi, A. (2019). Improving data sharing between acute hospitals in England: An overview of health record system distribution and retrospective observational analysis of inter-hospital transitions of care. *BMJ Open*, *9*(12). https://doi.org/10.1136/bmjopen-2019-031637

Yadav, S., Kazanji, N., K C, N., Paudel, S., Falatko, J., Shoichet, S., Maddens, M., Madden, M., & Barnes, M. A. (2016). Comparison of accuracy of physical examination findings in

initial progress notes between paper charts and a newly implemented electronic health

record. *Journal of American Medical Informatics Association*, *24*(1), 140–144.

https://doi.org/10.1093/jamia/ocw067

Yusif, S., Hafeez-Baig, A., & Soar, J. (2017). e-Health readiness assessment factors and

measuring tools: A systematic review. *International Journal of Medical Informatics*, *107*,

56–64. https://doi.org/10.1016/j.ijmedinf.2017.08.006

Zhang, S., Douglas, M., Sow, C., Strothers, H., & Rust, G. (2016). Disparities in primary care

EHR adoption rates. *Journal Health Care Poor Underserved*, *27*(1), 327–338.

https://doi.org/10.1353/hpu.2016.0016

Appendix A

Evaluation and Synthesis Table

Table A1

Evaluation Table Quantitative Studies

Citation	Theory/Conceptual Framework	Design/Method	Sample/Setting	Major Variables & Definitions	Measurement/Instrumentation	Data Analysis (Stat used)	Findings/Results	Level/quality of Evidence; Decision for practice/Application to Practice
Yusif et al. (2017) E-Health readiness assessment factors and measuring tools: A systematic Review **Funding:** AGRTP **Bias:** None	Inferred: Transition theory	**Design:** SR **Purpose:** Identifying studies, analyze readiness factors and offer recommendations on transitioning to EHR	**DS:** Medline, Pubmed, Cinahl, Web of science, PsychInfo, Proquest **IC:** Included if studies were assessing IS/T/mHealth readiness in the context of HIT	**IV:** N/A **DV:** measurement tools	**Measurement:** Data synthesis were thematically analyzed and interpreted	**DA:** Data synthesis involved collating and summarizing the results of included studies, synthesis can be descriptive (Non-quantitative	**Results:** Analyzed themes were found across 63 articles. "Technological readiness", 30(46%), "Core/Need/Motivational Readiness", 23 (37%), "Acceptance and use readiness", 19 (29%);	**LE:** I **Conclusion:** There is a strong need for reliable measuring tools for even the most commonly used readiness assessment factors **Strength:** Evaluated a large number of articles pertaining to

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Country:A US			Exclusion: Articles not written in English			e). Themes that emerged during DS were thematically y analyzed	"Organizational readiness", 20 (21%), "IT Skills/Training/ Learning readiness"(18%), "Engagement Readiness", 16 (24%), and "Societal Readiness", (14%)	readiness for change to EHR **Weakness:** The information was thorough but did not provide enough evidence for the author **Applicability to population:** This applies to my project as measurement tools of readiness is needed to overcome and identify barriers to transition to EHR

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Mason, et al., (2017). Overcoming barriers to implementing electronic health records in rural primary care clinics **Funding:** Not disclosed **Bias**: None **Country:** USA	**Stated CF:** CAS	**Design:** Qualitative and phenomenological study **Purpose:** to explore rural primary care physicians and PA across 2 rural PCPs experiences regarding overcoming barriers to implementing EHRs	**N:** 21 **Setting: 2** rural PCP Clinics	**IV:** Set of interview 30nvironm were asked **DV1:** The 30nviron men that were interviewed **DV2:** 2 different rural offices	**Instrumentation:** Set interview questions, modified van Kaam method	**Data Analysis:** QSR Nvivo software to analyzed common themes from participants	**Findings:** 4 themes emerged: lack of finances, health info exchange issues, lack of business education, and lack of change management	**LOE:** VI **Strength:** The study was thorough in evaluating the perceptions of 21 PCP employees in regard to HER **Weakness:** Small study of 21 participants, not RCT, did not disclose funding **Conclusion:** It is not feasible for all PCP offices to transition due to stated findings **Feasibility:** This study applies to my project as these themes also exist in identifying barriers to

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								transitioning to EHR
Gulliford et al., Electronic health records for intervention research: A cluster randomized trial to reduce antibiotic prescribing in primary care

Funding: joint Initiative in Electronic Patient Records and | **Inferred:** Technological Knowing | **Design:** cluster RCT **Purpose:** Aim to implement a point of care cluster RCT using EHR. Evaluating effectiveness of tools to reduce abx prescribing | **N:**104 n: 51 (I) n:51 (NI) Setting: Family practice

Sample Demographics:18 to 59 year old consulting for respiratory tract infections **IC:** individual patients 18-59 years old who were registered with the trial practices | **IV:** Computer support tools **DV:** Patients seen with respiratory tract 31nvironme receiving antibiotics | **Measurement:** Family practice-specific rates, adjusted for the preintervention value of the outcome and covariance framework | **DA:** Inferential analysis of patients who received treatment vs who did not | **Results:** 4 practices, 3 in intervention and 1 in control were excluded because 3 practices started contributing to up to date standard after and 1 finished contributing data before the intervention started. Abx prescribing for respiratory tract infection declined from 116 to 108 per 1000 cases. The adj mean -9.69(95% CI, -18.63 to -0.75) | **LOE:**II Strength: RCT, large sampling, measures effectiveness in usual health are settings **Weaknes**s: low utilization by some trial practices

Conclusion: There are challenges present in utilizing EHR tools. However, data is supporting decrease in abx prescribing |

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Databases in research **Bias:** Reports none **Country:** UK			**EC:** Children and older adults				**P**= .034	**Application:** Very applicable to study, as this RCT is evidence that supports the safety measures that can be implemented when EHR is present
Badowski et al., (2018). Electronic charting during simulation **Bias:** None **Funding:** Not disclosed **Country:** USA	**Inferred:** Technological knowing	**Design:** Descriptive study **Purpose:** To evaluate the number of LPN/RN programs utilizing EHR in their curriculum	N: 1 n: 9 demographic questions n: 16 questions focused on the use of EHR	**IV:** questionnaire **DV1:** Stimulation directors **DV2:** educations **DV3:** informatic	**Measurement:** anonymous online survey through Qualtrics (Qualtrics, Provo, UT)	**DA:** Descriptive statistics were used to describe the sample and results to questions on EHR	**Results:** 146 completed surveys 14.8% response. 82 participants (56.2%) indicated that they used EHR for simulation, lab and classroom. Of those 35 (19.6%) used EHR in	**LOE:** VI **Strengths:** Large sampling opportunity through anonymous online survey **Weaknesses:** Not RCT, The participants were only allowed 3 months to complete and

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				specialists **DV4:** Active RN program **DV5:** LPN program			classroom, and 71 (39.7%) in skills lab and 73 (40.8%) in the simulation lab	only reminded every 2 weeks **Conclusion:** Data Correlates that students are utilizing EHR in their clinical practice settings **Applicability:** Able to apply this study to support that RN/LPN programs are integrating EHR to prepare them for the workforce. This work force can also apply to PCP settings. EHR is the way of the future and technological advancements

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Elliot, et al., (2015). Evaluation of a hybrid-paper-electronic medication management system at a residential aged care facility **Bias:** none **Funding:** None disclosed **Country:** AUS	**Inferred:** Technological knowing	**Design:** Cross-sectional/Retrospective **Purpose:** Investigate discrepancies between general practitioners' paper medication orders and pharmaco-prepared electronic medication admin charts, back up paper charts and dose administration aids.	**Setting:** 90 bed residential aged care facility	**IV: Risk tool DV1:** EHR Medication chart **DV2:** Paper chart **DV3:** Causes of discrepancies	**Instrument:** Risk classification tool,	**DA:.** Data was analyzed to find the discrepancies between pharmacy and PCP medication utilizing descriptive analysis	**Results:** 88 pts managed by 24 PCP. Total prescribed 1230 medications: 759 scheduled, 467 PRN, and 4 short term. **Discrepancy audit:**125 discrepancies between These involved 145 medications, number of discrepancies ranged 0-9 (median 0.5; IQR 012)	**LOE:** IV **Strengths:**A lot of strong data was obtained to show that patients are at higher risk when medications are in paper format compared to EHR **Weakness:** One home facility was studied, not RCT **Feasibility:** This data is very strong in providing concrete evidence as to why EHR is important in minimizing risk to patients. This

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								can also cause delays in PCP setting for prescribing
Yadav, et,al., (2016) Comparison of accuracy of physical examination findings in initial progress notes between paper charts and a newly implemented electronic health record	**Inferred:** Technologic Knowing	**Method:** Retrospective chart review **Purpose:** Investigating concerns about the quality of documentation in EHR compared to paper charting	N 500 progress notes from August 2011 and July 2013 **n:** 5 specific diagnoses in the charts **IC:** PAF, AS, Intubation, lower limb amputation, CVA with hemiparesis **Exclusion:** Charts after July 2012 when EHR was implemente	**IV:** 5 specific diagnoses **DV1:** Different level of provider charting **DV2:** Inaccurate charts **DV3:** Level of training per charter **DV4;** time of charting, word count	Fisher's exact test, Mann-Whitney U-test, SPSS 21	**DA: P<0.5** **DV1:** 75% of notes from attending physicians **DV2:** EHR inaccuracy 24% Paper charting 4.4% **DV3:** Resident physicians higher rate of accuracy 77.9% attendings	**Results:** Inaccurate documentation higher in EHR compared to paper charting,.	**LOE: IV** **Strengths**: Modest amount of chart audits, comprehensive in comparing inaccuracies in assessment in EHR vs paper charting **Weakness:** Not RCT, not enough facilities audited **Feasibility:** Strong evidence to support paper charting had more accuracies in diagnoses, however EHR maintains to be better at

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			d, and ones that did not fit those diagnoses	and number of systems		48.8%, P>.001 **DV5**: Notes earlier in paper charts than EHR, median number of words in paper chart was 15, and 69 in EHR (p<.001)		including complete care plans
Warren, LR et, al., (2019) Improving data sharing between acute hospitals in England:	**Inferred:** Technological knowing	**Design:** Retrospective observational analysis **Purpose:** To determine the frequency of use and spatial distribution of	**Sample Setting :** Acute hospitals in England EC: Non acute care centers	**IV:**Acute care hospitals **IV2:**Patients attending these hospitals **DV:** Frequen	**Instrumentation:** Simple descriptive statistics were used, Microsoft Excel were used for data extraction and analysis	**DA:** Descriptive analysis. 117 (77%) of the 152 included acute hospitals were using EHR. 35	This large, national level study addressed the complex, dynamic issues of data sharing and health record interoperability in the context of	**LOE:** II **Strength:** Provides a large study of the implications of not having adequate EHR that communicate to each other

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An overview of health record system distribution and retrospective observational analysis of inter-hospital transitions of care **Bias:** N/A **Funding:** Independent research grants from the National Institute for Health Research, Imperial		health record systems		cy of use and spatial distribution of health record systems and the transitions of care		(23%) were using paper charts. 92/117 using EHR were using 1/21 different EHR systems. 12 (10%) were using multiple different EHR. Remaining 13 (11.1%) were using in house software.	acute hospitals in England.	**Weaknesses:** Specific of Acute Care **Feasibility:** Applies to helping build a strong background and significance of EHR and the barriers of converting several different types of practices to one uniform EHR

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Citation	Theory/Conceptual Framework	Design/Method	Sample/Setting	Major Variables & Definitions	Measurement/Instrumentation	Data Analysis (Stat used)	Findings/Results	Level/quality of Evidence; Decision for practice/Application to Practice
Patient Safety and Translational Research Centre **Country**: England								
Mack, et al., (2016). Disparities in primary care EHR adoption rates	**Inferred:** Transition theory	**Design:** Data collected through HITRC CRM tool to screen which providers were registered with EHR from 2007-2011 **Purpose**: To find out how many providers actually switched to EHR	N: 8,000 PCP IC: Community health centers, small private practices of one-10 providers, large group practices with over 10 providers, public hospital,	**IV:** EHR transition **DV1:** Community health **DV2:** Private practice **DV3:**Large practices **DV4:** public hospitals **DV5:** Rural	**Instrument:** Chi Square test, all tests were two-tailed, SAS9.2	**P<0.5 DV1/ DV2/DV3/ DV4:** >80% adoption rate prediction DV5: 53.3% adoption rate predicted	**Findings:** Medicaid predominant providers had a 32% chance of not switching to EHR.	**LOE:** VI Strength: A large sample although Weakness: The final numbers are not reported as this is an older study and was not updated after "go live" **Feasibility:** Supports my evidence based research on switching to EHR and my study is focused on a primarily

SR- Systematic Review **MA**- Meta-analysis **DV**-dependent variable;   **IC**- Inclusion criteria **EC**- Exclusion Criteria **IV**- independent variable; **N**-number of studies; **n**- number of participants **EHR**- Electronic Health Record **PRISMA**- Preferred Reporting Items for Systematic Reviews and Meta-Analyses **LOE**- Level of Evidence **REMI**- Random effects model for each indicator **DA**- Data Analysis **CI**- Confidence index **RR**- risk ratio **ADEs**- adverse drug effects **Pt**- Patient **AGRTP**- Australian Government Research Training Program **ICT**- Information and Communication Technology **HIT**- healthcare information technology **IS**- information system **T**- technology **DA**- Data Analysis **DS**- Data synthesis **AUS**-Australia **CF:** Conceptual Framework **CAS:** Complex adaptive systems **PA:** Physician Assistant **PCP:** Primary care physician **UK:** United Kingdom **Abx:** Antibiotics **I:** Intervention **NI:** Nonintervention **Adj:** Adjusted **PAF**: Persistent Atrial Fibrillation **AS:** Aortic stenosis **CVA:** Cerebrovascular accident **NRCT:** Non randomized control study **HITRC:** Health Information Technology Research Center **CRM**: customer relationship management **STOPP:** Screening Tool of Older People's Prescriptions **PIP**: Potentially Inappropriate Prescriptions **DQ**: Data Quality

Citation	Theory/Conceptual Framework	Design/Method	Sample/Setting	Major Variables & Definitions	Measurement/Instrumentation	Data Analysis (Stat used)	Findings/Results	Level/quality of Evidence; Decision for practice/Application to Practice
			rural health clinics, county public health units. **EC:** Providers that serve less than 30% of Medicaid and uninsured patients	health clinics **DV6:** county health				Medicaid insurance option
Price, et al., (2017). Applying STOPP guidelines in primary care through electronic medical record decision	**Inferred:** Transition theory	**Methods: RCT** Purpose: To understand how the STOPP prescribing criteria, in EHR could impact PIP	**N: 12** **IC:** PCP for Pts. >65 and using EHR for at least 12 months **EC:** Offices who do not provide longitudinal care, or who	**IV:** PCP offices **DV1:** Using STOPP **DV2:** Not using STOPP	**Measurement:** PIPs and DQ via UBC Department of Family practice research network	**PIP:** rate of 20%, expected reduction of 4% 0.8 and alpha=0.05	**Results:** Control group saw 1086 pts who could have triggered a PIP, and 1204 during treatment period. 138 PIP out of 5308 that could have been triggered. Both groups saw similar patients	**LOE:** II Strength: The data set was from a modest group sample Weakness: The results did not show a significant reduction in PIP in intervention group vs.

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Citation	Theory/Conceptual Framework	Design/Method	Sample/Setting	Major Variables & Definitions	Measurement/Instrumentation	Data Analysis (Stat used)	Findings/Results	Level/quality of Evidence; Decision for practice/Application to Practice
support: Randomized control trial highlighting the importance of data quality **Bias**: None Funding: not disclosed **Country**: Canada			do not use EHR				(44,290 in control group and 37,615 in the intervention group). Intervention group saw 3556 patients who could have triggered PIP, 768 out of 18,668 were identified. Control group identified 2.6%, intervention 4.0%	Control group with EHR STOPP alerts Feasibility: This study does not provide enough data to support the safety mechanisms that can sway PCP providers into wanting to adopt EHR. However, it does support the implementation of safety measures that could work in a PCP office I.E double prescribing or inappropriate prescribing

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Gidwani, et al., (2017) Impact of scribes on physician satisfaction, patient satisfaction, and charting efficiency: A randomized control trial **Bias**: None noted **Funding**: No funding Country: USA	**Inferred:** Technological knowing	**Design: RCT Purpose:** Scribes are being used despite lack of high-quality evidence regarding their effects	**N: 4 physicians n: 2 scribes**	**IV:** scribes **DV1:** Scribes with physicians **DV2:** Physicians without scribes **DV3:** Patient satisfaction **DV4:** Charting efficacy	**Measurement**: Physician self-administered 5 question questionnaire, 7 point Likert scale, Bon-ferroni correction	**DA: DV2:** 10.75 adjusted odds of high satisfaction, 3.71 adjusted odds of having face to face time with patients, 86.09 adjusted odds of high satisfaction of time spent charting DV1: no difference in	**Results:** Scribes increased physician satisfaction with quality and accuracy of their charting	**LOE:** II **Strength:** The RCT was thorough in providing evidence over a 52 week period of improved satisfaction and accuracy of charting using a scribe **Weakness:** The study sample was very small Feasibility: Great evidence for EHR and overcoming time constraints via EHR charting. With EHR you can utilize a scribe and increase patient face to face time

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Citation	Theory/Conceptual Framework	Design/Method	Sample/Setting	Major Variables & Definitions	Measurement/Instrumentation	Data Analysis (Stat used)	Findings/Results	Level/quality of Evidence; Decision for practice/Application to Practice
						satisfaction with no scribe **DV3:** .007 Bonferroni-corrected **DV4:** Time measured when chart closed, charts were closed within 48 hours		and solidify the need for EHR.

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Table A2

Synthesis Table

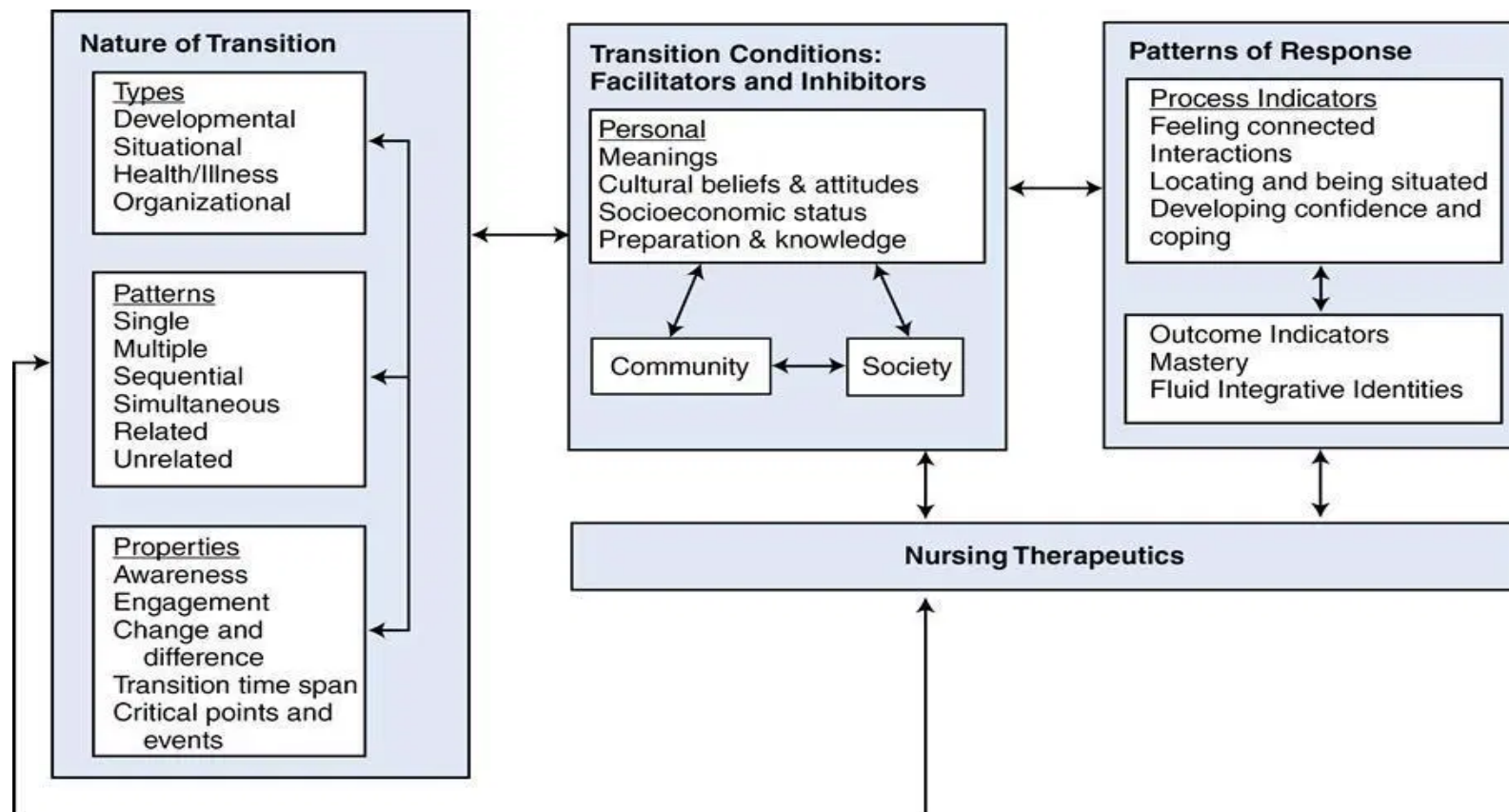|	Yusif, S., et al.	Mason, P., et al.	Gulliford, M., et al.	Badowski, D., et al.	Elliot, R., et al.	Yadav, S., et al.	Warren, L., et al.	Mack, D., et al.	Price, M., et al.	Gidwani, R., et al.
Year	2017	2017	2014	2018	2015	2015	2019	2016	2017	2017
Design/LOE	SR/ I	QS/VI	RCT/II	DV/VI	CS/RV/IV	RCR/IV	RV/IV	DC/VI	RCT/II	RCT/II
Study Characteristics										
EHR Implementation	X		X	X	X	X	X		X	X
IV										
PC Safe Alert			X			X			X	X
Acute Care	X				X		X			
PCP	X	X	X					X		
Data Sharing		X			X	X	X	X		
DV										
Efficiency			X	X	X	X				X
Px Safety			X		X				X	
Pt Satisfaction					X	X				X

SR- Systematic Review **CS/RV**- Cross sectional/ Retrospective **RCR** – Retrospective chart review **DV**- Descriptive **QS**- Qualitative study **DC** – Data collection **RCT**- Randomized Control Trial **Pt**- Patient **PX**- Prescription **PC**- Computer generated safe alert

Appendix B

Models and Frameworks

Figure 1

Theory of Transitions

Nature of Transition

Types
Developmental
Situational
Health/Illness
Organizational

Patterns
Single
Multiple
Sequential
Simultaneous
Related
Unrelated

Properties
Awareness
Engagement
Change and
    difference
Transition time span
Critical points and
    events

Transition Conditions: Facilitators and Inhibitors

Personal
Meanings
Cultural beliefs & attitudes
Socioeconomic status
Preparation & knowledge

Community ↔ Society

Patterns of Response

Process Indicators
Feeling connected
Interactions
Locating and being situated
Developing confidence and coping

Outcome Indicators
Mastery
Fluid Integrative Identities

Nursing Therapeutics

(Smith & Liehr, 2014, Figure 11.1)

Figure 2
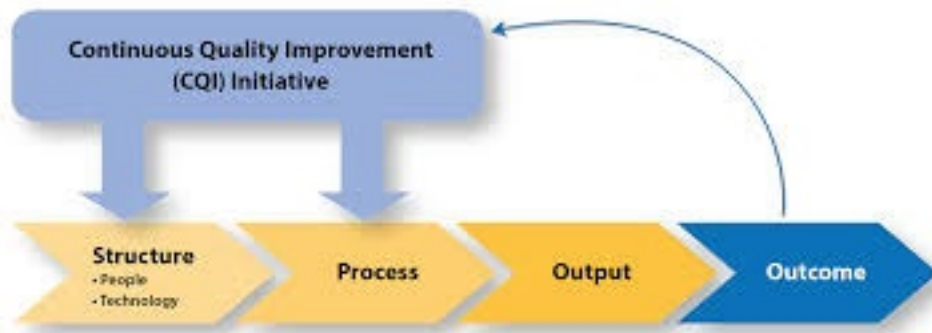
(The National Learning Consortium [NLC], 2013)

Appendix C

Budget Model

Figure 1.

EXPENSE ITEMS	Requested Amount	
Operations		
Scanner x 2	600	
Wi-fi Extender	70	
Window 10	200	
EHR supscription per provider monthly 500/mo x 12	6000	
Consultant Fees	0	
8 TB hard drive	150	
Volunteers/DNP project presentation/ Student		
TOTAL EXPENSES	7020	(without tax)

Budget Justification: The follow is justification for the items budgeted for this grant application amount: (cost itemization on page two)
1. Operations/Direct Costs:
   A. Equipment: High efficiency scanners to scan existing medical records at a efficient pace with capabilities of double sided scanning, Wifi extender to support use of computers and scanner attached to Wifi
   B. Materials and Supplies:
      a. Windows 10 upgrade on all 5 computers (shared product key for office) in order to support new EHR
      b. TB hard drive to store patient information in a protected and secure location.
      c. Subscription to EHR software and billing at 500 per month per provider and currently only one provider is agreeing to the transition
   2. Indirect Costs:
      a. Consultation for tech support was free as it was an initial overview of current wifi capabilities, windows operations, and accessibility of computers to internet access as well as modem and router.
      b. Volunteers who provide time at no costs to help scan and sort old medical records at the permission of physican
      c. DNP project champion student time to call old provider patients to see if they would transfer care or have medical records forwarded to physican taking over their care.
      d. Power point presentation of EHR selected, and email of instruement of measurement

  The funding is solely provided by the provider as it is a direct cost to the practice. Provider will provide all funding related to transitioning from paper charting to electronic charts. All other charges in the event of questionaires and additional supportive presentation will be incrued and paid for by student*

Cost Savings: Medicare charges currently a penalty fine of approximately $80 per day, 5 days a week for not having EHR = $400 dollars per week/$1600 per month of loss revenue. Current electronic billing is $235 dollars per month for both providers = $1,835 of loss revenue per month.

Cost analysis: $1,835 of loss revenue x 12 months = $22,020
                                    (- $7,077.12 initial start up cost for the first year)
                              Full implementation of EHR = -$500 monthly, **Saving $1,335 per month**

Figure 2.

OPERATIONS (Direct Costs	Equipment			Materials and Supplies			EHR Subscription/Billing			
	Fujitsu Scan Snap x 2		600	Microsoft windows 10 pro		200	Kareo EHR (Per provider) Monthly			
	Wi Fi Extender		70							
	8 TB External Hard drive		150							
Subtotal			820			200		6000		
Estimated Sales Tax (AZ = 5.6%)			45.92			11.2			0	
Total			865.92			211.2		6000	0	
Funding from Provider										
		7,077.12								
Est. Total Funding		7,077.12								
Indirect Costs	DNP student		0							
	DNP Powerpoint Presentation		0							
	DNP instrument via Email		0							
	Volunteer		0							
	Overtime for staff to learn EHR	Unknown								

Appendix D

Demographic 1.

        Have you had previous experience with an Electronic Health Record System?

        Yes

        No

Demographic 2.

        What role are you currently in?

        Management

        Administrative (billing, front office, back office)

        Clinical (physician, NP, PA)

        Medical Assistant

        Lab technician

        Volunteer

        Information Technology

Demographic 3.

        How long have you been in your role?

        Less than one year

        One – Three years

        Three – Five years

        Five- Ten Years

        10 years or more

1. EHR is viewed as…
   1- Not yet prepared- Only a requirement of government, insurers, or competitive environment
   2- Moderately Prepared- Primarily a project to achieve workflow efficiencies
   3- Highly prepared- A clinical transformation to enable quality of care and patient safety
2. The EHR related planning process includes…
   1- Not yet prepared- The administrator is primarily driving project
   2- Moderately Prepared- A large group of individuals primarily for communication purposes
   3- Highly prepared- Representative of physicians, nurses, other clinicians and other staff is participatory
3. Nurse involvement in the EHR process…
   1- Not yet prepared- Is not feasible
   2- Moderately Prepared- Primarily occurs by nursing leadership for key decisions
   3- Highly prepared- Is active, where several nurses are engaged in planning and decision making
4. The executive team…
   1- Not yet prepared- Relies on EHR vendor to provide planning and guidance
   2- Moderately Prepared- Delegates full responsibility for EHR to a specific person or team
   3- Highly prepared- Devotes substantial time to planning for clinical transformation with EHR
5. Staff and other human resources…
   1- Not yet prepared- Have not been told about EHR planning
   2- Moderately Prepared- Have been given general information about EHR planning but generally have little idea how it will impact their work
   3- Highly prepared- Have been included in communications about the EHR, including some specific activities
6. Client (or their family) involvement in the EHR process…
   1- Not yet prepared- Is not appropriate or feasible
   2- Moderately Prepared- Is acknowledged from the perspective that clients will ultimately need to be introduced to EHR used at the point of care
   3- Highly prepared- Is planned and clients are expected to be active partners in EHR and use
7. Leadership…
   1- Not yet prepared- Believes EHR are necessary, but is divided as to how to communicate why and when to pursue.
   2- Moderately Prepared- Has studied the pros and cons of implementing an EHR and can make an argument for why the benefits outweigh the costs
   3- Highly prepared- Understand the benefits of EHR and sets a clear and consistent vision for how EHR supports efficacy and quality improvement goals
8. Level of planning for successful EHR…
   1- Not yet prepared- Has not been discussed
   2- Moderately Prepared- Is recognized, but has not been formally addressed
   3- Highly prepared- Is understood and commitment to success is demonstrated
9. Quality and efficiency through EHR…
   1- Not yet prepared- Have been discussed, but there are no specific goals for improvement with EHR
   2- Moderately Prepared- Is recognized, but not defined in a measurable way nor connected with EHR
   3- Highly prepared- Is documented, and specific goals are clearly connected with EHR
10. Other information technology…
    1- Not yet prepared- Is used for financial purposes
    2- Moderately Prepared- Has been used for organizational operations, such as resources scheduling
    3- Highly prepared- Has been used to support some clinical information gathering such as OASIS reporting
11. Standard reports for management, quality improvement, etc.…

1- Not yet prepared- Have not been defined or documented
2- Moderately Prepared- Have been partially defined but have not been documented
3- Highly prepared- Have been defined, documented and requirements included in the evaluation process

12. Staffing needs for EHR implementation and use…
   1- Not yet prepared- Have not been analyzed
   2- Moderately Prepared- Are generally understood, but a staffing plan has not been developed
   3- Highly prepared- Have been documented in staffing model, detailing current and proposed needs

13. Current and proposed EHR enabled processes are…
   1- Not yet prepared- Not developed
   2- Moderately Prepared- Generally expected to change and there is a focus on general improvement efforts, but specific information workflow and process mapping has not been initiated
   3- Highly prepared- Understood to change, effort has been directed to fixing current broken processes, and there is good acceptance for need for standardization

14. Policies, procedures, and protocols necessary for EHR enabled processes…
   1- Not yet prepared- Are generally not documented today
   2- Moderately Prepared- Are starting to be documented and analyzed and a plan for development is in place
   3- Highly prepared- Have been analyzed and developed. Examples include information access rights, medical record corrections, IT contingency planning and record printing

15. EHR enabled referrals and other client – specific hand- offs…
   1- Not yet prepared- Have not been evaluated
   2- Moderately Prepared- Have been discussed but no specific plan exists
   3- Highly prepared- Have been designed and requirements included in the planning process

16. Chart conversion…
   1- Not yet prepared- Has not been addressed
   2- Moderately Prepared- Is recognized as an issue to be addressed and there is some understanding of options
   3- Highly prepared- Is currently being planned for, included preparation for data pre-load

17. IT staff…
   1- Not yet prepared- Are non-existent with total reliance on outsourcing
   2- Moderately Prepared- Are able to maintain current systems and have limited experience with system integration or data conversion but tend to rely on vendor to detail the tasks and activities
   3- Highly prepared- Have strong experience with system integration, data conversion and managing expert resources to fill internal skill or knowledge gap

18. IT staffing for EHR implementation, maintenance, infrastructure and ongoing user support…
   1- Not yet prepared- Has not been analyzed
   2- Moderately Prepared- Is generally understood but is not documented in the planning process
   3- Highly prepared- Has been documented in the staffing plan and requirements have been included in the process

19. An assessment of hardware necessary to support EHR…
   1- Not yet prepared- Is generally understood to be needed but has not been evaluated
   2- Moderately Prepared- Has been performed but not documented in the planning process
   3- Highly prepared- Has been performed and requirements included in the planning process

20. A plan for technical infrastructure using a high-availability platform, upgraded to be standardized and easily maintained…
   1- Not yet prepared- Is not in place; infrastructure will be upgraded according to vendor recommendations
   2- Moderately Prepared- Is being developed and will be standards-compliant for interoperability
   3- Highly prepared- Is in place and will be standards-compliant, including those for a statewide health information exchange

Appendix E
IRB Approval

ASU Knowledge Enterprise Development

EXEMPTION GRANTED

Erin Tharalson
EDSON: DNP

-

Erin.Tharalson@asu.edu

Dear Erin Tharalson:

On 9/9/2020 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	Enhancing Readiness to Support EHR Transition in an Outpatient Clinic
Investigator:	Erin Tharalson
IRB ID:	STUDY00012453
Funding:	None
Grant Title:	None
Grant ID:	None
Documents Reviewed:	• Agency Letter , Category: Other; • EnhancingReadiness_IRB Protocol_09-09-2020.docx, Category: IRB Protocol; • Long_D_CITItraining_certificate.pdf, Category: Other; • Permission for Tool, Category: Other; • Recruitment Email, Category: Recruitment Materials; • recruitment_methods_informedconsent_09-09- 2020.pdf, Category: Consent Form; • Survey Tool Questions , Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • Tharalson_E_CITI Training Certificate.pdf, Category: Other;

The IRB determined that the protocol is considered exempt pursuant to Federal Regulations 45CFR46 (2) Tests, surveys, interviews, or observation on 9/9/2020.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

If any changes are made to the study, the IRB must be notified at research.integrity@asu.edu to determine if additional reviews/approvals are required. Changes may include but not limited to revisions to data collection, survey and/or interview questions, and vulnerable populations, etc.

Sincerely,

IRB Administrator

cc: Darna Long
        Darna Long

Appendix F
Informed Consent

Enhancing Readiness to Support EHR Transition in an Outpatient clinic

Dear Participant,

I am a graduate student under the direction of Dr. Erin Tharalson in the Edson College of Nursing and Health Innovation at Arizona State University. I am conducting a study to evaluate readiness to transition to EHR. The purpose of this study is to evaluate your readiness in EHR transition before the EHR implementation, and after 16 weeks after implementation.

Participants will answer questions regarding readiness and anonymous demographics. The questionnaire will take approximately 15 minutes to complete. There will be additional time to answer any questions you may have regarding the survey. All responses will be anonymous. For the purposes of this project we will not collect your name or any other personal identifying information. The results of this project may be used in reports, presentation, or publications as aggregate data only and will not report any personal identifying information.

Your participation in this survey is voluntary. You can skip any questions on the questionnaires if you wish. If you choose not to participate or to withdraw at any time, there will be no penalty. It will not affect your patient interaction or employment in any way. You must be 18 years of age or older to participate. There are no foreseeable risks or discomforts to your participation.

Completing the survey will be considered your consent to participate. If you have any questions concerning this project, please contact the following team members:

Erin Tharalson, DNP, RN, ANP-BC, CWS at (480) 206-8076
Darna Long, BSN, RN at (480)457-9482

This project has been reviewed and approved by the Arizona State University Institutional Review Board. If you have any questions about your rights as a participant in this project, or if you feel you have been placed at risk, you can contact the Institutional Review Board, through the ASU Office of Research Integrity and Assurance, at (480)-965-6788.

Thank you,

Darna Long BSN, RN, Graduate Student
Erin Tharalson, DNP, RN, ANP-BC, CWS

Appendix G
Descriptive Analysis

Frequencies and Percentages

Table 1

Frequency Table for Nominal Variables

Variable	*n*	*%*
Time		
Pretest	4	66.67
Posttest	2	33.33
Have you had previous experiences with an EHR?		
Yes	5	83.33
No	1	16.67
What role are you currently in?		
Administrative	1	16.67
Clinical	2	33.33
Management	1	16.67
Medical Assistant	2	33.33
How long have you been in your role?		
Less than 1 year	1	16.67
10 years or more	2	33.33
1-3 years	3	50.00

Note. Due to rounding errors, percentages may not equal 100%.

Table 2
Summary Statistics Table for Interval and Ratio Variables

Variable	*M*	*SD*	*n*	SE_M	Min	Max	Kurtosis	Skewness
Confidence	2.05	0.40	6	0.16	1.55	2.55	-1.34	-0.26

Note. '-' indicates the statistic is undefined due to constant data or an insufficient sample size.

Table 3
Reliability Table for Confidence

Scale	No. of Items	α	Lower Bound	Upper Bound
Confidence	20	0.91	0.83	0.99

Note. The lower and upper bounds of Cronbach's α were calculated using a 95% confidence interval.

Table 4

Summary Statistics Table for Interval and Ratio Variables by Time

Variable	*M*	*SD*	*n*	*SE_M*	Min	Max	Kurtosis	Skewness
Confidence								
Pretest	2.29	0.19	4	0.09	2.15	2.55	-1.09	0.74
Posttest	1.57	0.04	2	0.03	1.55	1.60	-2.00	-0.00

Note. '-' indicates the statistic is undefined due to constant data or an insufficient sample size.

Figure 1

Profile Plot of Selected Variables grouped by Time