Smart Order Sets in Electronic Health Records to Decrease Provider Burden

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Abstract

Electronic or Smart Order Sets (SOS) can assist in standardizing care according to established guidelines, which can improve productivity for providers. SOS provides a virtual streamlined process, decreases burnout for providers, and provides for a positive impact on patient outcomes. Despite the benefits of SOS, there has not been a uniform adoption of this technology because of questions arising from its perceived usefulness. The DNP project attempted to create SOS into the existing EHR to decrease provider burden and improve patient outcomes. The aim was to decrease the amount of time spent by the provider towards EHR charting per patient encounter. The PDSA methodology was instrumental in enabling repetitive cycles of change to customize the order sets per the provider's preferences. The results indicated that while SOS could save time in charting, it remained difficult to determine the exact number of minutes saved with each patient encounter consistently, due to various reasons such as charting not completed in the student's presence, or patients not showing up for appointments, which affected the functional ability to test SOS. The provider provided qualitative feedback which suggested increased satisfaction with the created SOS, ease of finding orders, and improved continuity of care among providers. SOS helped integrate evidenced-based clinical guidelines into order sets, boosted organizational efficiency, created organizational uniformity, and delivered the best outcomes in care. Standardized SOS helped providers allocate saved time towards responding to patient queries in a timely manner, and improved patient-provider relations by increasing productivity and endorsed a component of joy among providers.

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Section I. Introduction

Background

Electronic order sets, when used appropriately in Electronic Health Records (EHR), can enhance efficiency, improve documentation, and assist in improving productivity for providers (Guo et al., 2017). Electronic order sets or "Smart Order Sets" can streamline virtual workflow, and the process can be utilized to increase patient safety (Guo et al., 2017). Provider burnout is often the resultant effect of an overburdened healthcare system (Guo et al., 2017). Smart Order Sets (SOS) can decrease burnout while simultaneously improving provider satisfaction (Chen et al., 2019). Decreased time wait for medication e-prescriptions as compared to paper prescriptions, reduced medication errors, and improved efficiency in prescribing patterns are some of the potential benefits of SOS for providers and patients (Gary & Hutchinson, 2019). Despite clear evidence indicating that SOS can improve patient outcomes, there has not been a uniform adoption of SOS into EHR (Chen et al., 2019). The reasons for this appear to vary, but studies have indicated that the financial expense associated with the adoption of this technology, along with questions arising from its perceived usefulness appears to be the primary causation for push-back (Chen et al., 2019).

Organizational Needs Statement

The organization has noted a need for Smart Order Sets to be a vital part of their health care practice. The family nurse practitioners at the practice follow evidence-based guidelines, and standardized order sets would help facilitate the consistency in practice. There is a lack of uniformity among the practice providers with the provision of patient care. Additionally, the Centers for Medicare and Medicaid Services (CMS), do have an EHR incentive program for providers and practices adopting health technology practices, making it ideal for eligible

professionals wanting to adopt this technology (CMS, 2017). According to CMS, Electronic Clinical Quality Measure Performance measure data by using the EHR to determine safety practices for patient care (CMS, 2017). The created SOS would incorporate evidence-based practice guidelines to target commonly seen health issues noted in clientele coming to this practice. The aim was to decrease provider burden through effective integration of SOS, resulting in reduced documentation time. This would enable all the practice providers to select a diagnosis-based algorithm as appropriate, choose indicated treatment modalities or interventions, and populate an after-visit summary that is specific to every patient. Thus, SOS would facilitate streamlined clinical decision making for the providers while recognizing individual differences among patients. Additionally, the SOS will allow for consistency and organizational uniformity among different providers within the same practice.

Healthy North Carolina 2030 has objectives that address disease conditions by teaching preventive measures to the patient population [NC Department of Health and Human Services, (NCDHHS), 2019]. This objective would be achieved at this practice through individualized health teaching and discharge instructions given to every patient. The after-visit summary would explain the diagnosis, management, home care, follow up, and include appropriate health education towards disease prevention. This practice believes that the delivery of specific, individualized health education would empower clients during the journey towards improved health literacy. Healthy People 2020 addresses the effective use of communication and technology by health care providers to assist patients in the pathway of health literacy (Office of Disease Prevention and Health Promotion [ODPHP], 2020). Health tools, such as effective discharge instructions, have been known to improve health quality and safety among patients (ODPHP, 2020). Personalized discharge instructions have notably improved health literacy in

patients (ODPHP, 2020). Presently, CMS objectives aim for a goal of 60% towards computerized provider order entry (CPOE) for all medication orders, laboratory orders, and diagnostic imaging orders to meet CMS measures (CMS, 2020). Furthermore, SOS can enhance the patient experience by focusing on measures aimed at improving the health of the population and potentially reducing future healthcare-associated costs (Bachynsky, 2020). As noted, the project addressed all four elements of the Institute for Healthcare Improvement's Quadruple Aim: by reducing costs, improving population health, enhancing the patient experience, and by making the workflow process easier for providers, thus decreasing burden (Bachynsky, 2020).

Problem Statement

There is a lack of standardized electronic order protocols in the practice among the family nurse practitioners, compromising organizational uniformity in the practice, and increasing provider burden for delivery towards improved patient outcomes.

Purpose Statement

The purpose of the DNP project was to decrease provider burden and improve patient outcomes by the creation of Smart Order Sets into the existing EHR.

Section II. Evidence

Literature Review

A literature search was conducted using databases as PubMed, Cochrane, Web of Science, One search ECU library, Google Scholar, Medline, and CINAHL. The MESH terms used were electronic order sets, computerized provider order entry (CPOE), provider burden, diagnosis based algorithm in CPOE, clinical decision support systems, health information technology, patient safety, health information management, electronic health records, electronic documentation, decision support system application, workflow, telemedicine, chart review, standardized order sets, and clinical innovation. Articles published between 2016 and 2020 were retrieved, with a total of 77,316 articles identified. Filtering criteria included English language, levels of evidence from IV and above, peer-reviewed, and literature less than five years of age unless the article accounted for a seminal piece of literature. Articles involving systematic reviews and meta-analyses were selected for inclusion. Any article that did not meet all the selected inclusion criteria was removed from review. There were 106 articles applicable to this project after reviewing the abstracts. There were 13 articles that were selected for a thorough, full-text review for the final literature inclusion.

Current State of Knowledge

The past decade has had several health care organizations universally adopting EHR (Bucher et al., 2019). CPOE has transformed the way providers incorporate and provide for patient care (Bucher et al., 2019). The incorporation of standardized order sets or Smart Order Sets (SOS) into the EHR is a noted core measure in most health care practices (Bucher et al., 2019). This directive has mostly been in direct response to the Health Information Technology for Economic and Clinical Health Act, whereby, health care organizations across the nation have begun to use an EHR with clinical decision support algorithms or Smart Order Sets (SOS), all

located in a single place (Kilsdonk et al., 2017). SOS can help providers customize orders to add value while standardizing care at the same time (Lee et al., 2018). Similarly, since built-in templates in SOS often reflect the best current practice, this tends to increase use and adherence, leading to lower overall variations in any clinical care process (Lee et al., 2018).

Current Approaches to Solving Population Problem(s)

Research has supported the adaptation of SOS into patient record systems based on improved patient outcomes and decreased clinical errors (Prgomet et al., 2017). The use of SOS alleviates provider burden, as it is a step up from traditional paper charting methods (Prgomet et al., 2017). Medication errors cause significant harm, including sentinel events in patients, with prescribers unknowingly adding to causation of the same (Prgomet et al., 2017). The evolution of information technology with designs in CPOE and clinical decision support systems have paved the way for safer weight and age-based dosing calculations, renal dosing, the screening of drug to drug interactions, scheduling of medications, and therapeutic monitoring (Roumeliotis et al., 2019). Research work has notably shown that prescribing errors to transcribing and administrative errors, have led to harmful medication errors (Roumeliotis et al., 2019). Systemic reviews have consistently indicated that CPOE with SOS decreases medication prescribing errors simply by reducing human error, which can be avoided through electronic weight-based medication calculations (Prgomet et al., 2017). As a decision support system, SOS can determine risk factors from side effects resulting from a combination of pharmacodynamic effects due to polypharmacy (Vélez-Díaz-Pallarés et al., 2018).

Furthermore, SOS promotes rational drug prescription because the best current practice guidelines are adopted, thus providing for patient safety (Vélez-Díaz-Pallarés et al., 2018).

CPOE, with electronic prescribing, in conjunction with SOS, has proven to be a successful strategy to overcome several prescription errors (Prgomet et al., 2017). The high incidence of medication errors with handwritten prescriptions is well conceded and remains a significant safety issue, increasing morbidity and mortality, and increasing costs of care (Roumeliotis et al., 2019). E-prescriptions are a goal for the project partner and the practice. Electronic trigger detection tools can be effectively harnessed to decrease adverse drug events and get notifications of these adverse drug events in real-time to prescribers (Vélez-Díaz-Pallarés et al., 2018). It is time-consuming to note drug allergies manually while prescribing; thus, CPOE with SOS has proven beneficial in avoiding known allergic responses by alerting providers to risky prescribing before processing the prescription (Legat et al., 2018).

Evidence-based guidelines form the basis of development for SOS in improving quality of care (Kilsdonk et al., 2017). SOS does offer providers patient-specific advice based on current guidelines, thus overcoming obstacles in traditional handwritten order sets (Kilsdonk et al., 2017). This also paves the way for provider adherence to standardized guidelines (Kilsdonk et al., 2017). The innovativeness and easy navigability of SOS is known to be essential for a well-integrated clinical flow for providers (Lee et al., 2018). SOS guidelines that promote safety and easy usability are a boon with time management and can decrease complications in clinician's workflow (Lee et al., 2018). Health information technology encompasses a host of interventions such as safe prescribing in the EHR, a user-friendly ordering system that addresses critical outcomes, and guideline-based clinical pathways (Neame et al., 2019). Healthy North Carolina 2030 has set objectives for preventing disease conditions through effective health teaching to the patient population (NCDHHS, 2019). After-visit summaries and health teaching populated via integrated SOS effectively addresses this measure, as health teaching will be a part of every

health care visit in SOS at the project partner's site.

The Centers for Medicare and Medicaid Services can measure data using EHR to critically evaluate key measures of safety in patient care, such as appropriate medication reconciliation, a decrease in medication errors, and safe medication prescriptions (CMS, 2017). Medication reconciliation on paper is resource-intensive, has a notable decreased adherence among providers, leading to gaps in patient care (Tamblyn et al., 2018). Electronic medication reconciliation increased nine-fold with community and hospital medication lists among patients with the integration of appropriate e-technology, providing for safe continuity of care (Tamblyn et al., 2018). Software tools have replaced repetitive manual recording of medication lists that are cumbersome to find on subsequent visits (Tamblyn et al., 2018).

Evidence to Support the Intervention

Research has been the pathway to address gaps in care and decrease medical errors (Prgomet et al., 2017). A cohort study proved that screening for medical complications through CPOE-structured interventions appears to decrease the manual burden for providers between 55.4% and 90.3% (Bucher et al., 2019). Systematic reviews of CPOE with clinical decision support systems in place have shown a 71% overall reduction in medication prescription errors, indicating improved patient safety (Vélez-Díaz-Pallarés et al., 2018). A systemic review of published studies indicated that interventional alerts in CPOE could beneficially influence prescriber behaviors by as much as 53%, through clinical decision support systems (Page et al., 2017). Prgomet et al. (2017) noted that the transition to CPOE systems from paper-based orders had an 85% reduction rate for prescribing errors and a 12% reduction in mortality. A systematic review involving qualitative determinations of the overall strength of evidence and quantitative meta-analysis in several studies determined that the use of CPOE is the best clinical practice to

support laboratory orders (Rubinstein et al., 2018). Research has indicated that reducing the provider's mental workload can decrease prescribing errors (Page et al., 2017). A quasi-experimental study indicated that free text entry in CPOE is cumbersome and time-consuming to providers, but SOS with structured data entry can save as much as 97% in time while simultaneously increasing meaningful detailed content as much as 55% (Linn et al., 2018). The study emphasized that structured data entry was deemed productive and efficient, with several outpatient settings thriving from the same (Linn et al., 2018). Most research and increasing data demonstrate that e-prescribing or CPOE with SOS enhances the quality and safety of healthcare services for both providers and patients (Page et al., 2018).

Evidence-Based Practice Framework

Identification of the Framework

The Plan, Check, Do, Act (PDSA) cycle, introduced by Walter Shewart in the 1920's, laid the foundational approach for Dr. W. E. Deming's organizational development and leadership framework (Moen & Norman, 2010). This model for learning and improvement supports a framework for iterative, cyclic testing of changes to bring changes to the quality of systems (Moen & Norman, 2010). This framework has been widely adopted for projects in healthcare improvement because this model for improvement sustains a framework for the development, testing, and implementation of changes that can bring about a change for the better (Moen & Norman, 2010). PDSA cycles can go to learning in test cycles of small-scale changes before wholesale implementation from structured studies (Moen & Norman, 2010). The cyclic testing with PDSA provides opportunities to note success or drawbacks, and can be a powerful learning tool, that aids in decision-making in terms of ideas and concepts that may or may not work (Moen & Norman, 2010). This process of change in a PDSA cycle is synonymous with

safety and causes minimal disruption to providers and patients alike (Moen & Norman, 2010).

This project aimed to have SOS incorporated into EHR as the project partner, and the practice has noted a need for the same. The PDSA cycle was determined to be a sound framework for development, testing, and implementing change in the created clinical decision algorithms created in SOS. The creation of SOS is a quality improvement (QI) project designed to decrease provider burden while improving patient safety and promoting standardization of care. The QI project will be implemented on the foundation of the PDSA framework in four main stages (Moen & Norman, 2010).

Plan.

Data was collected, such as demographics of the most commonly noted diagnoses at the clinic. The objectives were determined along with the project partner, prior to the formulation of algorithms in SOS to best assist providers with improved work efficiency and optimal use of time. After implementation into EHR, predictions were identified, such as possible roadblocks to outcomes. The PDSA framework would need two iterative cycles to work out any setbacks. The implementation of ten commonly noted diagnosis-based order sets was incorporated into the existing EHR to start the initial cycle.

Do.

This stage involved implementing and testing on a small scale, with the initial ten SOS algorithms, while continually noting issues arising from the same, such as SOS taking considerable time for providers to navigate through, or the SOS being ineffective for populating the correct after-visit summary.

Study.

Data was analyzed and collated to the initial predictions, where an assessment was made

about what has worked well with the current implementation of SOS into the EHR, and what would need restructuring to circumvent present roadblocks.

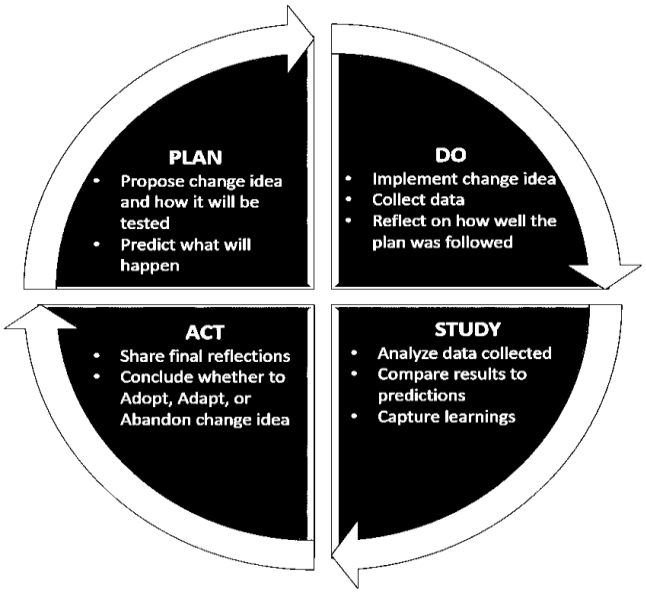
Act.

This final stage of this cycle emphasized modifications made, with continual reassessment and preparations for the next PDSA cycle, with all the newly formulated SOS implemented into EHR.

The PDSA's robust framework would support a minimum of two iterative cycles, ascertain accomplished goals, and determine if the changes made added noticeable improvement to provider burden, which made this framework apt for the development of SOS into the EHR for the organization's needs. The Model of Improvement in the PDSA framework supports improvement efforts like the introduction of a new service for an organization that would garner positive change, like the present project in hand (Moen & Norman, 2010).

Figure 1

Plan-Do-Study-Act



Note. This model illustrates the Components of PDSA.

Ethical Consideration & Protection of Human Subjects

The project partner and the co-partner are both family nurse practitioners and founded the practice together as a team. As sole proprietors to the clinic, this team sought to make a difference to the local population through the provision of affordable quality care and empowering patients in their health needs. The clinic was newly established over the past year. The project partner indicated a need for creation and incorporation of Smart Order Sets (SOS) into the existing EHR at the practice. The interventions for the project involved the creation of smart order sets, together with the formation of diagnoses-based algorithms will assist in populating after-summary visits, that addresses health teaching. The nature of the project ensures that there is no contact with patients, or any disclosure of any identifying information, which would not pose any ethical concerns. The target population comprised of the two providers at the clinic. The creation of SOS would decrease burden, and provide for efficient use of their time, while ensuring the patients at the practice are recipients of great care. The interventions of the project benefit both partners equally. They will have access to the same standardized order sets created, accounting for uniformity of care provided at the practice. The project interventions do not cause harm to the patients at the practice as the creation of SOS follows the best evidence-based practice guidelines. The uniformity of SOS promotes standardized practice, negating the prospect of any unintentional bias.

The Collaborative Institutional Training Initiative (CITI) modules training for Group 2: Social/Behavioral Research Investigators and Key Personnel modules have been completed in preparation for the formal approval process (CITI Program, 2017). This has been done in part towards fulfillment in following the university's existing approval towards the Institutional Review Board (IRB) process. The project site does not have any affiliation with East Carolina

University. The project partner has indicated that the practice does not have a formal IRB process. The site project partner has approved of the project and was agreeable to the completed CITI modules.

Section III. Project Design

Project Site and Population

The project site is a patient focused primary care practice based in North Raleigh. The clinic is headed by two family nurse practitioners. The mission of the clinic is to provide affordable quality care to the clientele and families, while empowering the patients to take control of their healthcare needs. The community-based practice was established to foster easy accessibility for the local population towards quality healthcare at a reduced cost. The practice believes in patient centered care to improve provider and patient engagement in healthcare, thus making a difference in health outcomes. EHR's with SOS and Smart phrases were initially deemed as documentation tools for the purpose of maintaining patient records and billing (Asan, 2017). However, in today's electronic documentation, tools such as SOS, and Smart phrases have the potential to integrate various components of practice to ensure patient-centered care, by improving health literacy in an outpatient setting by provision of tailored after-visit summaries (Asan, 2017). The integration of new SOS can change the dynamics of provider-patient interactions in an outpatient setting (Asan, 2017).

Barriers to the incorporation of documentation tools include reported increased cognitive workload of providers, which can have an adverse impact on provider-patient communication (Asan, 2017). Documentation tools, on occasion have had providers act less attentively to the patient population, leading to more disengaged patients, undermining the purpose of patient-centered care (Asan, 2017). Patients have reported feeling alienated when providers focus solely on a computer screen for the purpose of EHR documentation, which takes away patient and provider bonding (Asan, 2017). Studies have shown that with the adoption of health information technology across the country's health care system, several work system design issues tend to

receive increased attention and time, hindering patient-centered care (Asan, 2017). Several clicks within an EHR system tends to discourage providers, increasing time spent in documentation, rather than communication with patients (Asan, 2017). Certain providers also perceive a cluttered and congested display of information as complex, which can take away from the patient experience in an outpatient setting (Asan, 2017). Patients with certain disease conditions as depression, anxiety, or low literacy levels, or the elderly may have difficulty in engaging with providers (Asan, 2017). Face to face conversations take a backseat when EHR tools are solely used for communication (Asan, 2017). Reports indicate that providers are at risk for disruption in the thought processes during electronic charting, or while navigating through SOS, as patients ask questions throughout the visit (Asan, 2017).

Facilitators for the incorporation of documentation tools include streamlined access to historical data for known patients, which improves the provider-patient relationship (Asan, 2017). The sharing of provider's computer screens during EHR documentation assists in visual support of the provider's message, thus garnering the patient's inclusion into the clinic visit (Asan, 2017). Providers can build on transparency by inviting patients to view their laboratory results directly in the EHR, including patient visualization of trends in their health over time, which can contribute to a better provider-patient relationship (Asan, 2017). Built-in patient instructions with visit-specific summaries can integrate focused health teaching, making the goal of health literacy a reality for the patient population (Asan, 2017). Patients that are computer savvy and an interest in technology enjoy interactions of this kind in the healthcare environment (Asan, 2017). Smart order sets have often helped providers with detection of medical issues as trends are easily noticeable and shareable with patients, helping with easier understanding of the disease process and facilitating shared decision-making (Asan, 2017). Certain groups of

providers have reported that time saved with EHR documentation, has led to increased time spent with patients (Asan, 2017).

Description of the Setting

The setting for this DNP project was a privately-owned clinic downtown in central North Carolina. The practice is dedicated towards incorporating health teaching for the patients as part of improving health literacy. The clinic recently adopted the Athena network of integrated electronic health records. The creation of standardized order sets, and Smart phrases into Athena would decrease provider burden. The created focused health education, specific to every patient visit can improve health literacy for the patient population.

Description of the Population

The participants are the two practice providers at the clinic. The providers are licensed, doctorally-prepared, family nurse practitioners. The clinic does have an administrative assistant on the team as well. The clinic sees about 12-25 patients daily, averaging 60-100 patients weekly.

Project Team

The project team members consisted of the project site champion, the project faculty mentor, and the DNP student. The second provider at the practice identified as an informal team member.

Project Goals and Outcome Measures

The DNP project goal was to decrease the provider burden through the implementation of smart tools such as SOS, Smart phrases, and easy population of health education material for the practice's clientele. The DNP project is a process assessment of a quality improvement measure. The project site affirmed that there is no institutional review board (IRB) process. Collaborative

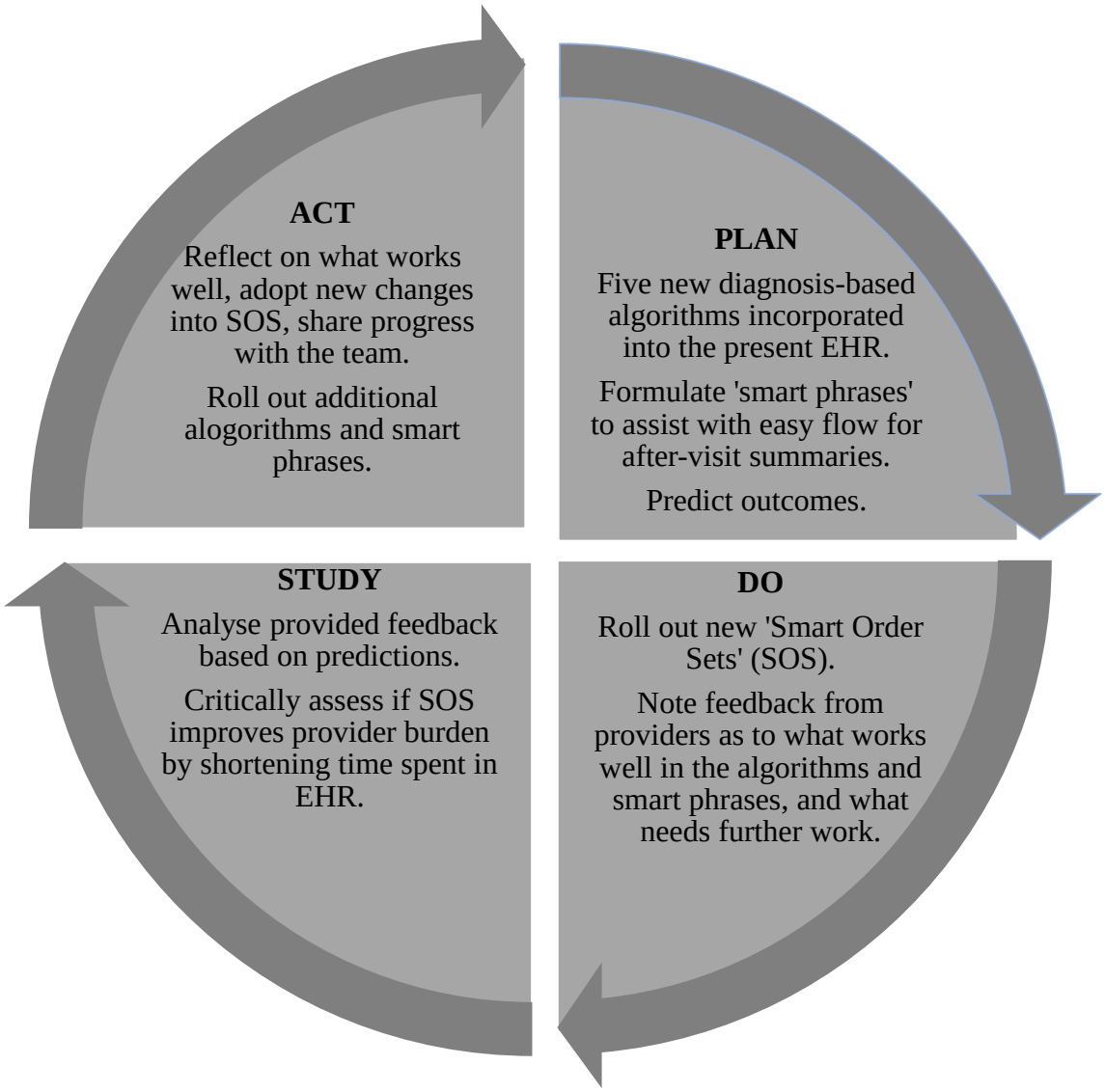
Institutional Training Initiative (CITI) modules were completed as part of ethics training for the purpose of this project. The nature of the project was such that there was no client contact with the DNP student. Additionally, the DNP student did not have access to patient's records or personal health information, decreasing concerns for violation of the Health Insurance Portability and Accountability Act.

Description of the Methods and Measurement

The Plan-Do-Study-Act (PDSA) cycle introduced by Walter Shewart was the chosen method for implementing this project [Institute for Healthcare Improvement (IHI), 2020b; Moen & Norman, 2010]. PDSA is a scientific model for improvement that provides a sound framework allowing for developing, testing, and implementing iterative changes to obtain information that results in improvement (IHI, 2020b; Moen & Norman, 2010). PDSA cycles enable small scale testing and build upon learning from the test cycles in a structured environment, prior to wholesale implementation. This method helped discern whether the proposed changes are achieving the desired goals. The PDSA framework is a powerful learning tool to test and receive feedback on changes that work and those that do not work. PDSA cycles are synonymous with safety and leave minimal disruptions for staff and patients, which made this framework ideal for the concept at hand. The PDSA method was revised every two weeks, for a total of two to four revisions in improvement and implementation cycles to achieve the ascertained goals of decreasing provider burden by decreasing time spent in electronic charting by two minutes per patient per visit. Subjective retrospective reporting by the providers that the Smart phrases and SOS saved time. There might be decreased documentation burdens due to ease of finding what is required for populating an after-visit summary.

Figure 1

Plan-Do-Study-Act Specific to the Project



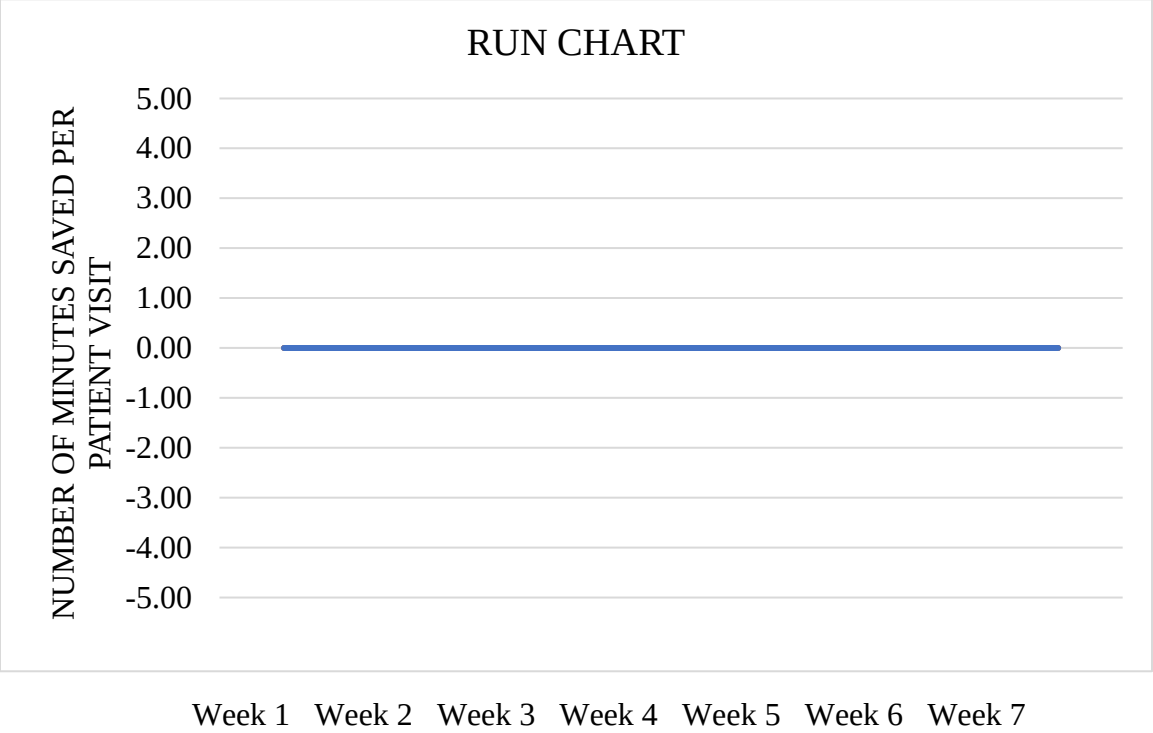
Note. This model illustrates the components of PDSA, specific to the DNP project in terms of planning, execution, revision, and final roll-out on a bigger scale.

Another tracking tool to track progress concretely over the course of the project implementation was a run chart (IHI, 2020c). The created run chart had weeks on the X-axis and the number of minutes saved per patient on the Y-axis. As results got plotted across the graph

over time, a centerline or median is developed. Over time, the centerline line will be an objective indicator to determine time saved by the provider. A run chart can reflect improvement that takes place over a period of time. A run chart can help discern if improvement has happened. This can accurately assess if the changes made were effective in working towards the aim of the project. Conversely, a run chart can depict how poorly a process is working, when data points consistently fall below the centerline over time (IHI, 2020c). The centerline that indicates two minutes saved per patient visit consistently, week after week will denote success of the project.

Figure 2

Run Chart



Note. This Run Chart illustrates the X-axis plotted over the number of weeks, and the Y-axis indicates minutes saved per patient following implementation of the new “Smart Order Sets”.

Discussion of the Data Collection Process

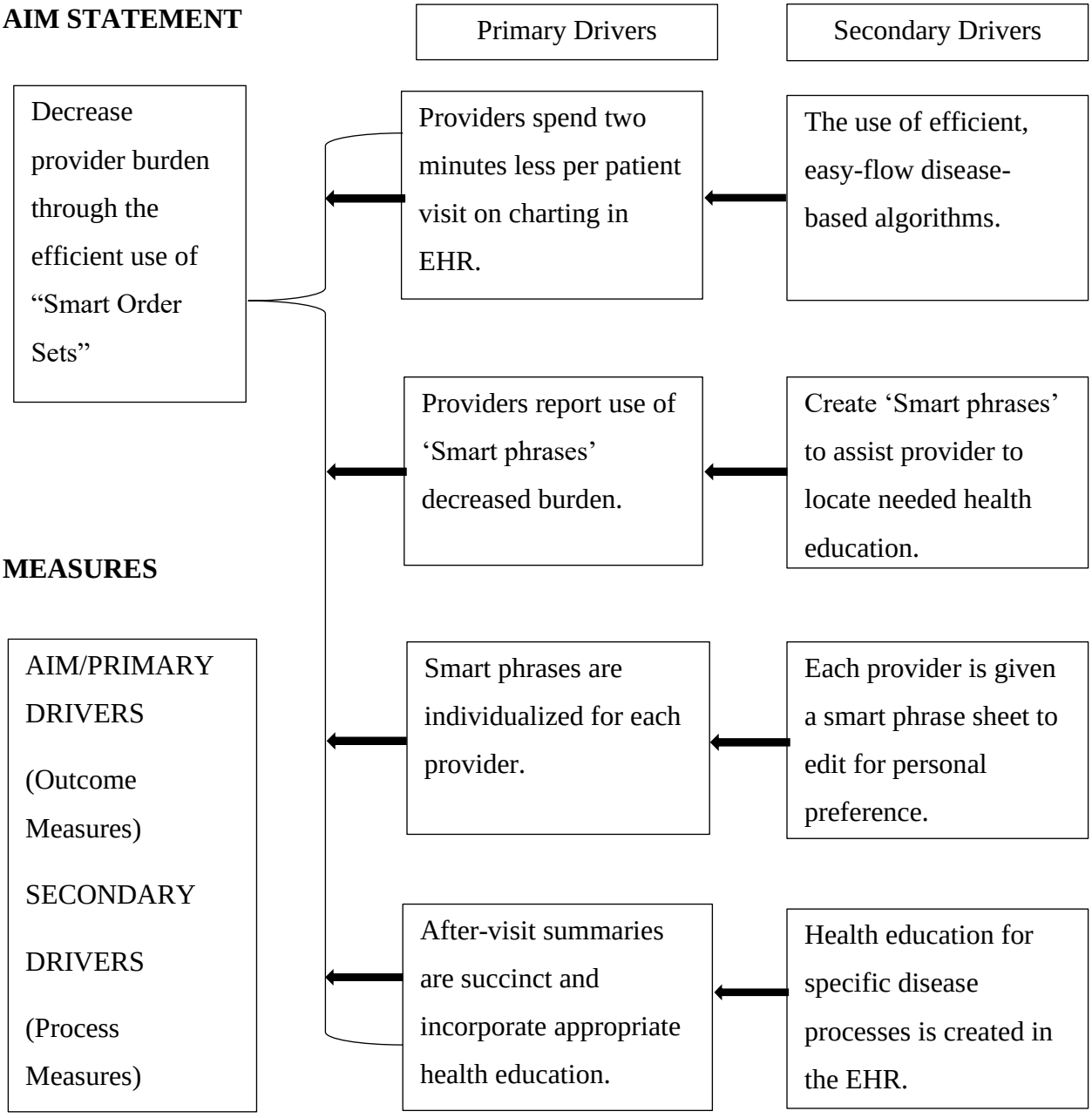
Weekly meetings from the initiation to the completion of the project was held between the site champion and the DNP student. The weekly meetings, either in person or virtually, served as a platform to exchange information for continued planning of the next stage of the DNP project, and for continued feedback for the processes already implemented. The data collection process utilized a communication tool, such as the Situation-Background-Assessment-Recommendation (SBAR), to provide for effective and succinct interchange of information between all members involved in the project, namely the site champion, the project faculty mentor, the partner provider, and the DNP student (IHI, 2020d). Situation denotes a concise statement, while background relates pertinent and brief information, with assessment comprising of analysis and considerations of options found, and lastly recommendation is the action requested (IHI, 2020d). An SBAR tool provided for a concrete framework of communication, that helped clinicians to understand the focus of the conversation with set expectations for action and feedback (IHI, 2020d). SBAR promoted a culture of healthcare teamwork and fostered patient safety, which was ideal for the project in hand (IHI, 2020d).

Implementation Plan

The driver diagram below explains the components of the project implementation plan in detail, starting with the aim, the primary and secondary drivers, and the outcome and process measures (IHI, 2020a). The aim is to decrease provider burden using EHR tools such as SOS, Smart phrases, and educational tools that self-populate the after-visit summaries. The processes and measures are listed below to achieve the determined aim, using a PDSA framework.

Figure 3

Driver Diagram Specific to the Project



Note. This driver diagram illustrates the aim, and the primary and secondary measures to achieve the established goals of the DNP project.

Timeline

The initiation phase of the project began in March to early May 2020 with finalizing the project partner, completing CITI modules, and affirmation of no IRB process at site. The planning phase from May to August 2020 involved discussing specifics for implementation of the ‘Smart Order Sets’ as establishing goals, demographic data collection, creation of SOS, Smart phrases, and targeted discharge teaching for after visit summaries. The planning phase did establish SBAR as a communication tool, and the RUN charts as a weekly progress plotting tool. The project implementation phase ran from August to December 2020, starting with the go live on five to ten SOS, and making predictions on the outcomes. The process underwent iterative changes based on provider feedback. Newer developed SOS did incorporate these changes for targeting decreased time in EHR charting. Results were formally interpreted from January to February 2021, with dissemination in March and April 2021. The project formally closed with a poster presentation at the college and submission of the DNP paper into the scholarship in April 2021.

Section IV. Results and Findings

Results

The project aimed to decrease the provider burden through the creation of SOS. The original expectation projected that the provider would save two minutes per patient in charting per patient visit. This quantitative measure could concretely establish any time saved in charting through easy navigation of the SOS. This would be measured in the form of a run chart, where results would be plotted weekly to determine a difference in timesaving. The project also relied on feedback from the provider to qualitatively measure how SOS brought out the element of joy and enhanced the work process for the provider. This process would be measured via SBAR communication through weekly meetings between the site champion and the student.

As the project progressed, it became apparent that it was challenging to concretely determine the time saved per patient encounter. Individual patients had multiple disease processes, while others had a single established complaint. The charting time before applying SOS varied, accordingly, post-SOS implementation, the charting varied based on the number of co-existing disease conditions or any new findings noted in this patient visit. This made it difficult to determine precisely how much time was saved per patient encounter. Secondly, charting in the EHR was not always completed in the clinic, which presented challenges for the student. The RUN charts could not be plotted week after week consistently. Communication through SBAR helped establish that the provider did find SOS useful and easy to navigate once the SOS had been worked on per the provider's preference. The provider did report saving time per patient encounter due to the easy flow of the SOS, versus having to search up orders individually in diagnostics, prescription planning, and discharge teaching. There was no way to establish exact details of time saved with every individual patient encounter, but provider

feedback confirmed satisfaction in the process.

Outcomes Data

Data was gathered weekly to determine two different components. The first determined what changes needed to be incorporated into the newly created SOS to make them work effectively for the provider. The second sought to find out which SOS would need to be created to build new order sets to further cover a broader base for all conditions managed at the clinic. Data collected focused on 'process measures' that sought to establish the 'outcome measures' (Burton, 2016).

Process measures collected data as 'time spent in EHR per patient encounter'. This process measured the turnaround time it took for the patient's diagnostic orders, to their medication orders, and finally the time spent in EHR for charting towards billing purposes. This process further measured if having pre-populated order sets helped in the process flow. Outcome measures addressed whether SOS served the purpose of decreasing provider burden and added to their satisfaction of documentation. Outcome measures also addressed whether the provider could quantitatively spend two minutes or less in documenting each patient encounter. PDSA cycles served to repetitively correct any order set to help the provider achieve target results. The very repetitive nature of the PDSA cycle served its purpose when feedback was received on the SOS flow created, or any additions needed, or any redundant orders deleted to keep a workflow process clean and streamlined.

Discussion of Major Findings

The original goal was to decrease provider burden, and documentation time through the creation and use of SOS. The predictions did support this hypothesis as the created SOS were a continual work in progress as they were repetitively tailored to work for the provider. The reality

was that it was hard to get an exact result in terms of minutes saved per patient encounter. Data collection could not be consistently plotted for results on a RUN chart as the provider did not have time to finish charting at the clinic in the student's presence for accurate determination, or sometimes the patients did not show up for planned appointments due to the COVID-19 crisis, which did affect ability to test the created SOS. The low census seen in the clinic affected the testing phase, as a lot more patients chose to forgo seeing the provider for regular follow-ups and only came in for emergent disease management. While it may have been challenging to plot run charts consistently due to data unavailability, the provider noted increased satisfaction in the created SOS and Smart phrases. The provider noted faster charting, ease of finding orders, easy accessibility from SOS, and credited the Smart phrases for streamlined discharge teaching. This qualitative feedback helped with the ongoing continuation of the project.

Section V. Interpretation and Implications

Cost Benefit Analysis

The DNP project involved creating SOS for the practice to improve productivity in terms of time spent in EHR charting for the practice providers. Several researchers have looked at the return on investment for smaller practices. Studies have shown that small practices, on average, have made up for software implementation upfront costs in about 30 months (Vant, 2016). The costs for EHR support should be calculated for both upfront and ongoing IT operation support staff. The initial costs would entail using an IT operation specialist to create the customized order sets for the practice. The ongoing costs would be for IT support fees for maintenance. The Office of the National Coordinator for Health Information Technology (ONC) discusses the importance of clinical application analysts for successful and ongoing implementation of any EHR system (2018). These individuals are highly trained and skilled, with costs varying depending on the type of EHR employed and the degree of support required, necessitating an ongoing monthly cost (ONC, 2018). Some companies charge a monthly maintenance fee between $4000-$8000 that includes unlimited access to their analysts, while others may bill per hour or incident ranging as much as $500 per instance as needed by the site for their support towards resolution of the issue (ONC, 2018). Analysts help with workflow design, educating staff on use of the chosen EHR, fluidity in charting, restructuring orders, or creating smart phrases to make it work individually for every provider in practice (ONC, 2018).

There are quantifiable benefits including increased revenue, increased provider productivity, along with improved operational efficiency with SOS implementation (Vant, 2016). There are non-quantifiable benefits like improved job satisfaction, increased patient satisfaction, and better patient outcomes using SOS and smart phrases (Vant, 2016). When efficiently used to

the full extent of intended capacity, the average EHR system can save a provider approximately 5,000 minutes per year in EHR charting (ONC, 2018).

The project practice site uses Athena Corporate as an EHR, which reports that their customers can complete documentation on up to 74% of all patient encounters the same day, with an average of 11% of these done out of office hours. Time savings has generally been attributed to centralized chart management, automated standardized checks by health plans upon order entry, and links to public health systems for mandatory communicable disease reporting (ONC, 2018). The extra time savings has generally contributed to provider satisfaction and increased time available to spend in face-to-face patient care. Health care providers have reported that there has been increased practice efficiency and cost savings through reduced transcription costs, streamlined documentation through automated coding capabilities, decreased medical errors on account of improved access to patient data, streamlined disease management, and focused patient education. SOS use with templates makes document creation easier while simultaneously cutting down on labor costs involved personnel employed to facilitate patient reminders and payer reimbursements (ONC, 2018).

The downside is that EHR upkeep and maintenance can be expensive, especially for a small private practice that is still trying to establish their clientele. Additionally, all EHR's do need frequent upgrades and new SOS as guidelines change, and newer evidence-based practice supports a better way of managing a disease process. Furthermore, computer failure and internet outage can easily render the entire system inaccessible.

This practice is a growing firm that caters to the health needs of the community. There is an increasing demand and general push for computerized charting, especially with patients requesting electronic portals to access test results and know the care plan. As such, having

streamlined care via SOS is the foundation to focused orders while keeping in mind the time needed by a provider for delivery of exceptional care. The practice recognizes this factor and deems the financial cost incurred as a good investment in return for various programs that offer pay for performance. Time saved through SOS can help providers safely cater to increased numbers of patients, making up for the cost of software and upkeep, while serving the ultimate philosophy of the clinic; providing affordable quality care to their patients and families.

Resource Management

The practice is primarily run by two experienced providers that serve as resources that add to a successful outcome to any endeavor. They have employed an office manager and well-trained the staff to believe in chosen outcomes sought by the practice. Athena, the EHR portal used by this practice, has support staff available 24 hours a day to assist with any ongoing issue or any newly emergent problem. The providers use this availability of staff from Athena Corporate, but it does seem time-consuming and takes away time from direct patient care. The organization does need weekly maintenance support from Athena consistently to create or upgrade their order sets or maximize value for time spent in EHR to avoid any repetitious charting and improve provider productivity. There is also the need for additional staff in their office, as a medical technician who could take on specific responsibilities, freeing up the provider time to focus on SOS upkeep and creation.

Implications of the Findings

This project sought to increase provider satisfaction by decreasing their burden by negating some of the time spent in EHR charting via SOS. The results measured of this specific project outcome were achieved by tracing process measures as the exact amount of time spent by the provider per patient encounter in EHR charting. The preliminary findings of this study

indicated that the provider has found an element of joy via decreasing their burden through faster, streamlined processes in EHR via SOS.

Implications for Patients

Most EHR systems do give both providers and patients a portal for communication. This communication method allows for a safe exchange of health information among both parties. Check in to check out times for patient have dropped from 40 minutes to about 35-39 minutes on account of the created SOS and smart phrases, which does provide for patient satisfaction due to a shorter turnover time. Patient satisfaction has been accounted for because the provider has 'saved time' left over to respond to patient messages promptly, or refill medications, and update clients on their resulted laboratory and radiologic tests.

Implications for Nursing Practice

SOS has saved the providers time spent navigating through order sets while discerning what is needed for a patient. SOS has helped decrease the time spent in charting by approximately two to three minutes, which was noted on a few occasions, albeit not consistently. This helped the provider re-allocate time towards patient queries, filling in online prescriptions, and facilitating improved provider-patient relations through prompt replies. The provider endorsed a component of joy, as the time saved did productively decrease burden.

Impact for Healthcare Systems

SOS has helped make document creation virtual and seamless. The easy transition of the created SOS helps providers navigate a chart in simple steps without missing out on any aspect or part of an order set, providing for organizational efficiency. There is increased accuracy in the documentation, which helps support the diagnosis and makes claims submission an easy transition. SOS also provides preventative care, with easy tracking, which assists a provider in

providing comprehensive care. SOS has effectively integrated evidence-based clinical guidelines into the order sets, accounting for delivering the best outcomes in care. Time saved from using SOS and Smart phrases has helped cut down on labor as the providers have extra minutes saved up in a workday to attend to tasks that would typically require added personnel. For example, laboratory results called to patients by medical assistants can be done by providers, which improves communication lines between patients and providers, and provides a personalized service. Lastly, a certified EHR system in a provider office can assist in meeting Medicare and Medicaid Meaningful Use requirements to take access incentives offered by the federal government.

Sustainability

The practice was able to note improvements in the delivery of care via the implementation of SOS. The two practice providers plan on continuing to create SOS as needed, along with Smart Phrases for discharge education to cut down on time spent in EHR charting. Presently, the providers are fronting the cost of the maintenance analysts by using Athena Corporate to assist in the upkeep of the EHR used at the practice, which does come at a price. The time saved using SOS has both providers offer up more patient slots for provider availability. SOS will need constant upgrading to keep up with evidence-based practice measures employed by governing bodies. By fronting the initial costs of installing the software in the past year, the present costs continue to involve maintenance and technology support. The practice has been hit economically by the COVID crisis, and stiff competition from other medical practices and medical institutions that offer multiple services in the same facility, which have an added advantage. As a relatively new practice, the providers are trying to break open in the market and rely on clientele in increased numbers to support the practice. The project is sustainable, should

the number of patients increase at the clinic.

Dissemination Plan

The project findings were presented to the College of Nursing and the project partners individually via a virtual forum. The DNP Project Poster Presentation for the College of Nursing, East Carolina University was presented formally to the faculty, staff, and peers on April 6th, 2021. Additionally, the project findings were discussed with the project partner on March 26th, 2021. The final submission of the DNP paper was sent to the Scholarship on April 24th, 2021. The American Medical Information Association (AMIA) Annual Symposium Student Paper Competition will be held at their Annual Symposium on October 30th -November 3rd, 2021, in San Diego, California. Submissions for the student paper are due by May 21st, 2021. Finalists will be contacted for potential presentation based on content. The Conference specifically calls solutions, ideas, and innovations, in terms of health IT-related challenges faced, in terms of experience-based clinical informatics projects like this one, in areas that impact quality, safety in healthcare. This annual symposium seeks topics of interest from the community of clinical informatics professionals that address emerging trends in health information technology that can impact the delivery of care. Guidelines include no marketing or promotion of a specific product or company, but presentation panels or posters are acceptable for submission.

Section VI. Conclusion

Limitations

The project involved obtaining consistent feedback from the provider over the created SOS and Smart phrases. The feedback would enable changes, if any, additions, if necessary, and deletions as required. It was noted that the providers were busy and could not consistently provide feedback in a timely manner; thus, meeting times were changed to accommodate the busy schedules of the provider. The exact numbers of minutes saved in EHR charting could not be established consistently as client visit time slots were continually changing based on the number of presenting medical issues. Furthermore, the numbers of patients have been lower than predicted due to COVID-19 restrictions, and since the practice is still attempting to establish steady clients, it was difficult to test all the created SOS to intended functional capacity.

Recommendations for Others

The current DNP project is a sustainable project as the creation of SOS is ongoing and will need to be updated with any change in guidelines. The presently created SOS and Smart phrases will need updating to incorporate changes made by newer clinical guidelines as applicable or changed to reflect newer medication choices as preferred by providers. There are frequent updates noted in the EHR system that would necessitate adjusting SOS, to achieve the goals that the providers need, such like decreased time spent in EHR charting. As the patient clientele grow in this practice, it is advisable to create more SOS as necessary to reflect all disease conditions seen at the practice. The DNP project would continue to need an overview from the project partner and the other provider to incorporate their preferences in any further created SOS. Face to face meetings would need to be planned out of work to engage all parties for optimal results.

Recommendations for Further Study

The DNP project is best studied with a larger number of patients to conclusively prove time saved is a constant. It would be interesting to note other variables, such as provider fatigue, with the number of 'clicks' involved in populating orders. Poor usability can force recipients to go through more steps or clicks to complete a task. SOS was created with the intention to decrease provider burden, but it would be interesting to note if newer technology creates a barrier by increasing the time spent in EHR charting, thus defeating the original intended purpose. Another constant with health information technology is the ever evolving and necessary updates to keep up with system upgrades. Constant innovation and change will have users relearning newer technology that could be a detriment towards any time-saving intent. There could also be an evolving need to improve the provider experience by re-structuring the present SOS to pursue meaningful use requirements. Will the process involve 'provider fatigue' and a decrease in the element of joy over time? Or could technology win the day with newer improvements that continue to decrease provider burden and spark patient engagement?

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Appendix

Timeline

Table 1

Project Timeline of the DNP Project

Project Phase	Date	Milestones
Initiation	March 1st-April 1st 2020	Finalized project partner and DNP topic. Confirmed no IRB process for site, Complete CITI modules for the college IRB process.
Planning	June 10th- July 14th	Plan for Go-Live Implementation of 'Smart Order Sets' (SOS). Met virtually with the partner to discuss goals of the proposed project with the project site champion, the partner, and the project faculty mentor. Establish goals of the project with the site champion. For example: SOS will reduce provider burden by decreasing time spent in EHR charting by two minutes per patient encounter. Collected demographic data as listed in the earlier section. Attempted to navigate and master Athena health as an EHR system. Noted five most seen diagnosis at this clinic to create SOS with the clinic site champion to note the provider's personal preferences. Discussed the creation of 'Smart phrases' per individual provider preference. Discussed the creation of after-visit summaries specific to care provided at this visit. Discussed SBAR as a communication tool for updates and feedback.
	July 15th	Formulated a Run Chart as a tracking tool to plot progress over time. Plotted out the timeline of the DNP Project.
	July 16th-July 20th	Created the five discussed SOS. Created separate lists of smart phrases for each provider per personal preference. Created health teaching plans that can be populated for specific health education for after-visit summaries.
	July 21st	Met with Project champion to discuss the Project Implementation Tool, Tracking Tool and the Timeline of Project.

		Discussed the weekly meeting times and dates, and the days that the student will be on the site. Distributed copies of smart phrases to individual providers for perusal.
Implementation	August 12th	Physically at the site to implement the DNP Project, roll out five SOS into the Athena EHR. Made predictions as to what will go well during this live implementation, and what might need revision. Incorporated specific discharge teaching into the EHR to populate effective after-visit summaries for their patients. Observed providers using the smart phrases firsthand to note any difficulties that need addressing and noted what went well during live implementation.
Monitoring	August 19th	Met with site project champion to discuss the results of 'Go Live' implementation. Received feedback, discussed alternatives and address ways to decrease time spent in EHR charting. Reflected on predicted outcomes. Plotted daily results on RUN Charts based on the provider feedback.
	August 20th- August 25th	Revised SOS/ Health teaching, Smart phrases based on feedback. Plotted weekly results on Run Charts based on the provider feedback.
	August 26th	Rolled out revised SOS, revised health teaching, and revised smart phrases if applicable. Met with site champion, received feedback from providers for week three.
	September 2nd	Met with the site project champion, received feedback after the past week of the revised SOS have been in use. Reflected on what has gone well, what can be improved. Observed first-hand, how well the project implementation is running and note if any improvements can be made. Discussed next 10-20 most commonly noted diagnosis to roll out the new SOS over the next week.
	September 3rd - September 8th	Formulated SOS for going live with 10-20 most commonly noted disease conditions managed by providers at the clinic. Formulated new smart phrases as necessary. Addressed discharge teaching associated with the next set of SOS.
	September 9th	Met with the site champion, discussed the previous week's feedback.

		Continually evaluated what is going well with this project, and what could go better. Discussed solutions to improve setbacks, if any. Rolled out new SOS, Smart phrases, and health teaching for the after-visit summaries. Continued to plot daily and weekly results on Run Charts.
	September 16th-October 7th	Met with site champion weekly, discussed the previous week's feedback. Re-evaluated the execution of all SOS in the EHR, the smart phrases, and after-visit summaries. Revised any needed SOS to work for the providers. Plotted results on the RUN Charts. Attempted establishing centerline on RUN Charts. Added meaningful changes into EHR.
	October 14th -November 18th	Met with site champion for the weekly, discussed the previous week's feedback. Re-evaluated the execution of all SOS in the EHR, the smart phrases, and after-visit summaries. Revised any needed SOS to work for the providers. Plotted results on the RUN Charts. Add meaningful changes into EHR. Critically assessed if the last 9 weeks has made a discernable change, by noting feedback from providers, as well as the centerline on RUN chart is showing an improvement.
	November 25th	Virtual meeting with site champion and project faculty mentor. Met with site champion for the last time for this semester, discussed the previous week's feedback. Re-evaluated the execution of all SOS in the EHR, the smart phrases, and after-visit summaries. Revised any needed SOS to work for the providers. Plotted results on the RUN Charts. Thanked the site champion and all members of the team. Congratulated them for their patience and hard work. Discussed dates for dissemination of the results of the project to site champion in upcoming 2021.
Results	January 20th	Online meet with Project Faculty to discuss limitations of the DNP project.
	January 21st-February 24th	Thorough assessment using RUN charts to accurately interpret the collected data to determine if the discerned change was an improvement, noted there was inconsistent data. Ascertained if the project interventions, as the created SOS, Smart phrases, and the populated after-visit

		summaries are sustainable to continue to decrease provider burden and improve health literacy for their client population. Critically performed a cost-benefit analysis to determine if the resources and the cost, balanced the achieved results.
Dissemination	February 25th-March 29th	Met with Project Faculty Mentor, and the project site champion to disseminate results. Discussed the limitations and recommendations for practice and further study. Received critical feedback from the Project site champion, and the project faculty member.
Closing	March 30th-April 2nd	Prepared poster for presentation. Finished the project report.
	April 5th-April 26th	Project Poster Presentation at the College. Submission of the DNP paper into the scholarship.

Note. The timeline depicted for various stages of the project.

Table 2

Mapping of Doctor of Nursing Practice Essentials

	Description	Demonstration of Knowledge
Essential I Scientific Underpinning for Practice	**Competency** – Analyzes and uses information to develop practice **Competency** -Integrates knowledge from humanities and science into context of nursing **Competency** -Translates research to improve practice **Competency** -Integrates research, theory, and practice to develop new approaches toward improved practice and outcomes	A need was noted to decrease provider burden. A sound base of knowledge was mapped to know the current state of known subject matter, followed by a plan to introduce standardized 'Smart Order Sets' using evidenced based research, a theoretical framework, and teamwork to establish improved patient literacy while decreasing provider burden.
Essential II Organizational & Systems Leadership for Quality Improvement & Systems Thinking	**Competency** –Develops and evaluates practice based on science and integrates policy and humanities **Competency** –Assumes and ensures accountability for quality care and patient safety **Competency** -Demonstrates critical and reflective thinking **Competency** -Advocates for improved quality, access, and cost of health care; monitors costs and budgets **Competency** -Develops and implements innovations incorporating principles of change **Competency** - Effectively communicates practice knowledge in writing and orally to improve quality **Competency** - Develops and evaluates strategies to manage ethical dilemmas in patient care and within health care delivery systems	Several 'SOS' were introduced using a PDSA framework. This incorporates a culture of change, while using critical thinking. SBAR methods of communication, while keeping in mind budgets for continuing SOS in a sustainable manner were explored.
Essential III Clinical Scholarship & Analytical Methods for Evidence-	**Competency** - Critically analyzes literature to determine best practices **Competency** - Implements evaluation processes to measure process and patient outcomes	A RUN chart was developed to critically evaluate a concrete number of minutes saved per patient encounter by the provider to analytically study results.

Based Practice	**Competency** - Designs and implements quality improvement strategies to promote safety, efficiency, and equitable quality care for patients **Competency** - Applies knowledge to develop practice guidelines **Competency** - Uses informatics to identify, analyze, and predict best practice and patient outcomes **Competency** - Collaborate in research and disseminate findings	SBAR communication was adapted to communicate results on a weekly basis, after analyzing the previous week's data.
Essential IV Information Systems – Technology & Patient Care Technology for the Improvement & Transformation of Health Care	**Competency** - Design/select and utilize software to analyze practice and consumer information systems that can improve the delivery & quality of care **Competency** - Analyze and operationalize patient care technologies **Competency** - Evaluate technology regarding ethics, efficiency and accuracy **Competency** - Evaluates systems of care using health information technologies	Athena was used as a Health Information Technology system to deliver care to patients seen, this technology has pre-selected discharge instructions that could be modified and saved in a provider view after modifying the same instructions per individual preference in the implementation phase of the project.
Essential V Health Care Policy of Advocacy in Health Care	**Competency**- Analyzes health policy from the perspective of patients, nursing and other stakeholders **Competency** – Provides leadership in developing and implementing health policy **Competency** –Influences policymakers, formally and informally, in local and global settings **Competency** – Educates stakeholders regarding policy **Competency** – Advocates for nursing within the policy arena **Competency**- Participates in policy agendas that assist with finance, regulation and health care delivery **Competency** – Advocates for equitable and ethical health care	CMS began promoting standardized healthcare teaching with discharge instructions in a bid to improve patient literacy. Policymakers had introduced a bill that supported standardized computerized charting that enabled efficient sharing of appropriate health information among providers caring for the same patient. By using this technology and adhering to present guidelines, the element of safe and regulated healthcare delivery is addressed.

Essential VI Interprofessional Collaboration for Improving Patient & Population Health Outcomes	**Competency**- Uses effective collaboration and communication to develop and implement practice, policy, standards of care, and scholarship **Competency** – Provide leadership to interprofessional care teams **Competency** – Consult interprofessional and interprofessional to develop systems of care in complex settings	This DNP project utilized the highest standards of current guidelines in use while creating the SOS for use at the practice. The entire project was led by the student NP, with in-depth collaboration with the site partner, and the project faculty as professionals, to develop, implement and evaluate the project.
Essential VII Clinical Prevention & Population Health for Improving the Nation's Health	**Competency**- Integrates epidemiology, biostatistics, and data to facilitate individual and population health care delivery **Competency** – Synthesizes information & cultural competency to develop & use health promotion/disease prevention strategies to address gaps in care **Competency** – Evaluates and implements change strategies of models of health care delivery to improve quality and address diversity	Health literacy was addressed by focused health teaching in the form of discharge instructions to specifically focus on preventative, diagnostic and curative care for the disease process as necessary.
Essential VIII Advanced Nursing Practice	**Competency**- Melds diversity & cultural sensitivity to conduct systematic assessment of health parameters in varied settings **Competency** – Design, implement & evaluate nursing interventions to promote quality **Competency** – Develop & maintain patient relationships **Competency** –Demonstrate advanced clinical judgment and systematic thoughts to improve patient outcomes **Competency** – Mentor and support fellow nurses **Competency**- Provide support for individuals and systems experiencing change and transitions **Competency** –Use systems analysis to evaluate practice efficiency, care delivery, fiscal responsibility, ethical responsibility, and quality outcomes measures	Quality outcomes of this project were measured by qualitative feedback from the practice provider for continual adjustment in the SOS to ultimately create an environment of decreased provider burden and bringing about the essence of joy for all the practice providers.

Note. DNP essentials with exemplars from the DNP Project.