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Optimizing Electronic Medication Prior Authorization: Reducing Prescription Delays

Arnold Butiu
Boise State University

Optimizing Electronic Medication Prior Authorization: Reducing Prescription Delays

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By

Arnold Butiu

Approved: _Cara Gallegos, PhD, RN_____, Chairperson

_Kelly Connor, PhD, RN_____ __, Committee Member

Approval Acknowledged: _Pamela Gehrke, EdD, RN_____, DNP Program Director

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Abstract

Background: Within the United States, chronic disease in children has doubled over the last 20 years. Many diseases defined as chronic (attention deficit, epilepsy, and diabetes) require daily medication regimens for optimal management. To be covered by insurance, many of these medications require prior authorization (PA) from the patients' pharmacy benefits policy. Delays in processing and receiving PA orders can lead to worsening disease and inadequate disease management.

In 2014, a pediatric academic medical center in the Midwest found that processing medications from prescription order to PA approval took nurses an average of over 90 hours. In August 2020, the organization implemented an electronic prior authorization (ePA) system that interfaced with the organization's electronic health record (EHR). The primary goals of this implementation were to reduce medication PA turnaround times and to increase employee engagement with the ePA system.

The goals of this quality improvement (QI) project are to optimize the existing ePA system with the medication PA process to reduce average medication PA turnaround times and to increase the approval rates for medication PAs by five percent.

Project Design: Three interventions support the outputs of this QI project.

1. Increase the availability of the ePA system by changing the patient and pharmacy benefits insurance matching interface logic.
2. Reduce the number of medications falsely requiring PA by removing them from the ePA system.
3. Increase PA processing efficiency by improving the workflow for attaching documents required for PA approval.

To accomplish and measure these interventions, data reports and surveys were developed to establish baselines and to measure ePA turnaround times, PA approval rates, and user satisfaction both pre- and post-intervention. User satisfaction was measured utilizing a secure online survey emailed to ambulatory division nurses.

Results: The median medication ePA turnaround pre- and post-interventions was unchanged at 36 hours. The ePA approval percentage dropped from 55.7% in June 2021 to 46.9% in August 2021. The primary QI project outcomes of reducing turnaround time and increasing the approval rate by 5% were not met. A user involvement survey was sent to 194 nurses with a response rate of 29% pre intervention and 8% post intervention. Overall user satisfaction was measured using a net promotor score which registered scores of –70 pre- and –82 post-intervention, revealing overall dissatisfaction with the ePA system. The use of an alternative ePA system outside the organization's EHR was discovered after the QI project data was reviewed and showed that roughly 45% of ePAs were completed using this alternative system during the QI project timeframe.

Recommendations: User involvement surveys measure user engagement with electronic systems and measuring user satisfaction is beneficial to providing direction for interventions as well as predicting future utilization of healthcare informatics projects.

Conclusion: Though most of the goals for this QI project outcome were not met, use of the alternative ePA system confirmed the Technology Acceptance Model that users prefer the electronic system that they *perceive* as being the most useful. Nurses using ePA will use the system that best addresses their own user experiences regarding content, accuracy, format, timeliness, ease of use, and overall satisfaction.

Keywords: medication prior authorization, electronic prior authorization, post implementation evaluation, health information technology project evaluation, implementation evaluation tools, and user satisfaction

Optimizing Electronic Medication Prior Authorization: Reducing Prescription Delays

Patients who are prescribed medications requiring pharmacy benefits prior authorization (PA) often experience delays in receiving them. These delays result in worsening disease status and inadequate disease management (Bergeson et al., 2013; Dunn et al., 2017). To reduce PA medication delays, this pediatric organization in the Midwest implemented an electronic medication prior authorization (ePA) system that interfaced with the organization's electronic health record (EHR) system, thus safely automating communication between the ordering provider and the patients' pharmacy benefits manager. This quality improvement (QI) project optimizes and evaluates the ePA application program interface (ePA API) with the medication PA process through specifically designed interventions in order to reduce medication PA turnaround times, increase employee engagement with the ePA system, and better serve the pediatric population in management of various chronic diseases such as diabetes, ADHD, and epilepsy.

Background

The Centers for Disease Control (CDC) defines chronic diseases as health conditions requiring ongoing medical attention, limiting activities for daily living, and lasting more than a year (2020). In the United States, the number of children with chronic disease has dramatically increased from 12.8% in 1994 to 26.6% in 2006 (Van Cleave et al., 2010). Juvenile diabetes increased 23% between 2001 and 2009 (Van Cleave et al., 2010). In 2015, epilepsy affected 479,000 children in the United States, which is roughly 1 in 20 children (Zack & Kobau, 2015). Attention deficit and hyperactivity disorders (ADHD) is one of the most common neurodevelopmental disorders in childhood and in 2011, it affected 1 in 10 children ([*Attention-*

deficit/hyperactivity Disorder (ADHD]), n.d.). As chronic diseases, diabetes, epilepsy, and ADHD have treatment medications, most requiring prior authorization from the patient's pharmacy benefits plan in order to be fully covered by insurance.

These PAs are required by health care insurance companies for many reasons, but primarily to minimize costs through reducing duplication, to ensure the medications are medically necessary, and to encourage less expensive alternative medications if possible. Medications requiring PA have increased from 8% to approximately 24% of covered drugs on Medicare Part D plans between 2007 and 2019 (Resnick, 2020). In four therapeutic classes, the number of steps required to obtain medication PA doubled in 5 years between 2011 and 2016 (Resnick, 2020). Though Medicare Part D primarily provides pharmacy benefits for patients over the age of 65, the state of Illinois' Medicaid pharmacy benefits insurance and formulary closely aligns with it. At the pediatric organization, approximately 54% of patients are covered by Illinois Medicaid or Medicaid Managed Care Organizations. Children with chronic diseases such as diabetes, epilepsy, attention deficit and hyperactivity (ADHD), and asthma require daily medications for proper disease management and to prevent clinical crises such as diabetic ketoacidosis, psychiatric emergencies, asthma exacerbations, and seizures. Requiring medication PA subjects these patients to immediate time delays as medications are held pending verification or denial of insurance coverage. These delays result in worsening disease status and inadequate disease management (Bergeson et al., 2013; Dunn et al., 2017).

Local Problem

Delays and denials in receiving medications can result in significant morbidity and mortality for pediatric patients with chronic diseases.

For example, critical diabetes medications such as insulin, metformin, and sodium glucose inhibitors, along with the glucometers and supplies necessary to administer and monitor the disease, require medication PA from most healthcare insurers.

Diabetes is the second most common chronic disease in the Chicago pediatric population. In Chicago, the incidence of diabetes in "individuals <18 years of age increased 2.7% per annum between 1994 and 2003" (Estrada, Danielson, Drum, & Lipton, 2009). At the pediatric organization, the rate of newly diagnosed type 2 diabetes has tripled since 2012, matching the rate increase found in the United States. In North America, the incidence of Type 2 diabetes mellitus "now accounts for about 15% to 45% of all newly diagnosed cases of diabetes in children and teenagers" (Fagot-Campagna et al., 2000, p. 668). Along with the increased rate of newly diagnosed type 2 diabetes, Chicago youth have experienced a tripling of obesity rates (Reinehr, 2013). A 2019 Community Health Needs Assessment from the pediatric organization lists chronic disease as one of four health priorities needing to be addressed with a strategic plan ("*Community Health Needs Assessment*," 2019, p. 5). This population health data clearly reveals that the prevalence, incidence, and morbidity and mortality of diabetes is increasing, and proper disease management should be a priority for achieving improved health within the pediatric population.

In 2015, the pediatric organization ambulatory leaders completed a performance improvement assessment requiring nursing staff to manually track the amount of time it took for prescriptions requiring PA in seven ambulatory specialties to be filled/approved? When measured from EHR order to PA approval time, the data revealed that it took an average of over 90 hours for medications requiring PA to be approved. The assessment also found that full-time nurses spent an average of 5 hours per week processing medication PAs, including phone calls,

faxes, emails, and navigation of pharmacy insurance portals. Ambulatory nurses considered this time administrative work and voiced their dissatisfaction with specific comments in the pediatric organizations 2018 employee engagement survey. Time spent processing PAs could instead be spent on primary ambulatory care nursing responsibilities such as coordinating patient care, providing patient education, managing medications, and providing direct clinical care.

In addition to nursing, other healthcare professionals such as pharmacists, medical assistants, physicians, and advanced practice providers participate in or perform the medication PAs, spending equivalent amounts of time doing so. According to an American Medical Association physician survey, physicians and their teams spent an average of almost 14.9 hours each week completing prior authorizations (AMA, 2018). Any time spent processing these medication PAs is considered a delay, and the literature demonstrates that these delays result in worsening disease status due to missed medication doses, decreased overall medication adherence, and increased medication abandonment.

Available Knowledge

Literature Review

A literature search using the PICOT methodology (Dang & Dearholt, 2018) was conducted. It asked the following evidence-based, practice searchable question: “Will a post IT project optimization with a user adoption and satisfaction evaluation reduce delays in receiving medications requiring PA in a pediatric chronic disease population?”

The databases PubMed, OVID Medline, CINAHL, and Business Source Premier were searched (2000 to present) using the following keywords: medication prior authorization, electronic prior authorization, post implementation, evaluation, health IT, optimization, medication delays, user adoption, informatics, project evaluation, and summative evaluations.

Over 160 articles were returned and after review of the titles and/or abstracts, 14 were found to be relevant. They are detailed in the Literature Review Table (Appendix A). The articles were reviewed for study design and quality as defined by the John's Hopkins Research Evidence Appraisal Tool and Non-Research Evidence Tool (Dang & Dearholt, 2018).

The articles consist of six level IIIs, three level IV, and five level Vs and can be applied to several different specialty divisions at the pediatric organization. The first six explore the impact of medication PA on clinical outcomes and support the background premise that medications requiring PA result in poorer health outcomes for pediatric patients with chronic diseases. The last eight articles fall under the category of intervention and support possible interventions such as centralized PA teams and automated ePA systems.

Synthesis of the Evidence

Impact of Medication Authorization Delays

There were six articles supporting the evidence-based premise (EBP)—that medication PA delays result in worsening clinical outcomes. All were high or good quality level III and were published within the last decade. They were nonexperimental, quantitatively designed, and used sample sizes greater than 100. The Bergeson article (2013) was most representative as it was specific to the diabetic population defined in the problem statement and also had a large amount of data culled from Medicare claims databases. Bergeson found that patients with approved PAs maintained current therapy at higher rates than those with denied PAs.

The article by Shah (2014), a meta-analysis of fourteen other studies, was also strong. It aggregated a large pool of data and found that even though medication PA restrictions may result in cost-savings, they must be considered within the context of patient safety and quality of life concerns. The strengths of a meta-analysis study are also the study's limitations, as the Shah

study pulled from such a large sample size that it may have inadvertently included patients who should have been excluded from the dataset, such as inpatients and outpatient surgery patients.

Neurology/epilepsy was the 3rd highest specialty division requiring PA medications at the pediatric organization. According to Wirrell (2018), patients with new onset epilepsy medications requiring PA experienced delays in receiving them and consequently experienced more seizure activity.

The other four articles, while not specific to the most common chronic diseases in the pediatric population, were relevant as they related to other chronic disease conditions such as dermatology, cardiology, and rheumatology and supported the same finding of worsening clinical outcomes due to delays in receiving PA medications. All seven articles reviewed medications critical to the primary treatment of their respective diseases. Taken together, all provide a good foundation for the background of the EBP premise—that delays from medication PAs result in worsening clinical outcomes in patients across several specialty divisions.

Evidence Supporting Possible Interventions

There were eight articles supportive of possible interventions. Three were consensus statements from prominent healthcare organizations: the Office of the Inspector Generals (OIG), the American Medical Association (AMA), and the Academy of Managed Care Pharmacy (Academy of Managed Care Pharmacy Professional Practice Committee, 2019: American Medical Association [AMA], 2019: U.S. Department of Health and Human Services-Office of the Inspector General, 2019). Two of these three consensus statement articles provide references and data in support of their recommended interventions, but it must be noted that many of these references come from vendor specific data sources and are thus considered gray articles. Though these three articles are of lower evidence level, they also are consistent in providing very specific

actions and interventions designed to address the problem in the EBP question and contribute heavily in the possible interventions for this QI project.

All three consensus articles suggest five interventions or action items, two of which are specific to insurance companies. This QI project will focus only on those interventions specific to health care organizations. The interventions suggested are as follows:

1. Insurance companies reduce medications requiring prior authorization by continually reviewing data supporting efficacy and clinical impact.
2. Insurance companies improve communication with patients/families and providers regarding medications requiring PA.
3. Health care organizations implement a centralized team to process medications requiring PA.
4. Health care organizations implement an automated electronic prior authorization (ePA) system.
5. Health care organizations standardize the electronic transactions between pharmacies and insurance pharmacy benefits management systems and patients.

There was only one article of good quality specifically suggesting an automated electronic medication PA solution to reducing delays and denials in medication PAs. This was not surprising, as electronic medication PA systems capable of interfacing with an organization's EHR were not available until 2015 when CoverMyMeds© announced its integration with Epic Systems©. The article by Bhattacharjee (2016) was a Level III non-experimental, qualitative, ethnographic study in which the authors mapped the PA process for 29 community providers in eight different organizations to determine problem points. The biggest limitation of this study was that data capture occurred over a very short period of one week in April 2015. Again, the

level IV and V consensus statement articles suggest automated electronic PA systems but the references they provide are gray material sources coming from the only two electronic prior authorization ePA API solution vendors currently available—Surescripts© and CoverMyMeds©. According to a provider survey by CoverMyMeds©, 91% of respondents report that the PA process results in delayed access to necessary care, and 75% report that the PA process leads to patients abandoning treatment altogether (Resnick, 2020). The data provided by these two vendors confirms the data reported in this article review: that there is a time delay for medications requiring PA, and that an electronic medication ePA system integrated with the EHR does reduce the time to authorization. Because they are not considered transparent and unbiased, or rated as good or high quality, the references from these vendors are not formally included in this synthesis of the evidence (Appendix A).

The Currie (2005) article, along with the Kaplan (2001) article, provide assessments of different informatics evaluation frameworks and study designs which serve as foundations for selecting the best summative evaluation tools for electronic medication prior authorization system implementation, user adoption, and satisfaction.

Recommendations Based on the Findings

The pediatric organization implemented the ePA system in August of 2020. Based on article findings, the intervention of a health IT project optimization with pre/post evaluation was recommended. There were three articles supporting these possible interventions and many articles supporting electronic health record (EHR) implementation evaluations, but none specifically reviewing ePA system implementations. Most articles followed the methodology of evaluating technical, clinical, usability, and cost outcomes from the IT project.

Ward (2011) wrote a non-research level V, prospective post implementation survey of high quality with a good sample size of over 705 nurses. The survey instrument used by Ward (2011) was a validated tool and was implemented on nurses as the target participants. The article provided clear transparency on survey methods, data collection, and the interpretations of the data. While the article was limited in that it was not specific to ePA implementation, nor to the pediatric or diabetic population, the article is relevant and can translate to possible interventions such as centralized PA teams led by pharmacists to address the EBP question.

Kumar (2015) wrote a level V high quality article that was a prospective post implementation survey. He completed a literature review of existing summative post implementation survey tools and implemented a tool to evaluate EHR implementation within two different organizations. This article is relevant to the EBP question as it reviews several summative post implementation survey tools which can be used as interventions in this QI project.

The third article from Cresswell (2012) supported post implementation evaluation and optimization as a possible intervention. This was a high-quality Level III systemic review comprised of meta-analysis of 13 articles. This study is particularly relevant for the intervention of a post IT implementation optimization as the author assesses the technical, social, and organizational factors impacting health IT projects. Several articles within the meta-analysis assess the diffusion of innovation social science theory and its impact on user adoption and satisfaction. Together, these three articles support the premise that increased user satisfaction and adoption results in the increased use of health IT interventions such as electronic medication PA systems.

Rationale

Theoretical Model

Two theoretical models useful in guiding this project's development are the Technology Acceptance Model (TAM) and the Diffusion of Innovation Model (DoI). (Refer to Appendix B, Figures 1 and 2).

The Technology Acceptance Model posits that user's intent to use, and actual usage behavior of a technology are predicated by their perceptions of the technology's usefulness (Davis et al., 1989). The TAM also suggests that perceptions of usefulness and usability are influenced by external variables (individual differences system characteristics), as well as social influences (organization culture and hierarchies, environmental conditions). This theory ties directly to the relationship between user satisfaction, project optimization, and utilization of this new ePA system.

The second model helping to guide this project is the Diffusion of Innovation theoretical (DoI) model. This model is a social science theory explaining the adoption of innovation within a population or social system such as healthcare workers (Rogers, 2003). The study of how populations adopt innovations such as healthcare technology is important when evaluating new technology implementations. User adoption of the electronic medication prior authorization application will be important in evaluating its efficacy and relationship to desired outcomes.

Project Framework and Organization

To implement this QI Project, the Kellogg Logic Model (Appendix C) was used in conjunction with the Gantt Chart Timeline (Appendix D) and the SWOT (Strengths, Weaknesses, Opportunities, Threats) Analysis Table (Appendix E) to provide an overall framework, establish baselines, evaluate potential obstacles, and implement pre- and post-optimization interventions.

The Kellogg Logic Model provided the overall project framework for this project (Kellogg, 2006). This logic model is crucial to project planning and evaluation, and offers a clear, concise framework by aligning resources, activities, and outputs to specific outcomes. The inputs in this model include the nurses, chronic disease pediatric patients, providers, ambulatory operations leadership, and information technology leadership. The proposed logic model outcomes are twofold: faster medication prior authorization time and increased user satisfaction and adoption of the ePA system.

Specific Aims

The interventions being applied in this QI project aim to reduce the amount of time it takes for PA medications to be approved, thus enabling patients to receive their medications sooner, improving clinical quality outcomes for pediatric patients with chronic disease This intervention will be accomplished by increasing the utilization of the ePA system and streamlining workflow processes. A survey measuring user satisfaction and adoption will be completed pre- and post-optimization. This QI project analyzes the relationship between the optimization of the ePA system and user satisfaction and utilization (user adoption) and evaluates whether improving user satisfaction results in increased utilization, thereby reducing median medication PA approval times.

Context

Population

The populations being examined are twofold. The primary population is the ambulatory nurses who perform the majority of the medication prior authorizations. There are roughly 200 ambulatory clinic nurses staffing 36 specialty divisions at the pediatric organization. Of these, 98% hold a bachelor’s degree in nursing or higher, and over 50% have greater than 10 years of

experience. There are a few providers (physicians and advanced practice professionals) who also perform prior authorizations, but they have been excluded from this QI project due to the difficulty of separating them from the other ePA users.

The second population group is made up of chronic disease patients and families affected by delays in receiving their PA medications.

It was difficult to measure chronic disease patient volumes at the pediatric organization. A report based on chronic disease diagnosis' who had a visit at the pediatric organization in the last 2 years, which can be found in Table 3, page 44, estimates that there are about 54,00 active patients. The endocrine division had roughly 800 inpatient admissions and 16,000 outpatient visits in 2019. The pediatric organization has 368 licensed inpatient beds and 14 outpatient centers. The organization has over 1,665 medical staff in more than 70 pediatric specialties and provided care for over 212,860 unique patients in 2018.

Settings and Resources

The pediatric organizations diabetes program is certified by the American Diabetes Association and provides care at another pediatric hospital in the south side neighborhood of Chicago. The entire diabetes program includes six physicians, two advanced practice providers, a medical director, one nurse manager, seven certified diabetes nurse educators (CDE), one clinical diabetes nutritionist educator, and one psychologist. The nursing team is supplemented with six more Endocrine division nurses who cross-cover the diabetes team as needed and perform many medication PAs for endocrine patients. This is a multi-disciplinary, team-based staffing model where each role (provider, educator, nurse, nutritionist, psychologist) is responsible for specific parts of care for our diabetes patients. The diabetes team also has a

robust research program and leads, or is involved in, multiple high value grants and collaboratives.

The team treats patients at six outpatient centers, with the primary diabetes center located within the outpatient center in the Lincoln Park neighborhood of Chicago. The primary diabetes center has 6 exam rooms, a lab, an education room, a team room with seven workstations, a nurses' station, and an outpatient psychologists' room. The diabetes nurse's office, where most medication PAs are completed, is in an office building across from the hospital. Each nurse has a cubicle with a phone and computer. All providers and some nurses are granted access to the hospital's secure Virtual Private Network (VPN) which grants remote access to the Epic EHR and secure telephony and allows them to perform medication PAs remotely.

The pediatric organization provides the resources of a change management system supportive of project requests such as this and manages all projects through an Enterprise Project Management Office (EPMO). This office determines the resources needed for project support and brings the projects to senior leadership for decisions to scope and implement. It is the EPMO that verifies support from the various teams such as Information Technology, Process Improvement, Facilities, Pharmacy, Risk/Legal, and aligns the resources to reduce and resolve conflicts.

Project Alignment with Organizational Mission, Values, Strategies, and Needs Assessment

The pediatric organization is a free standing, not for profit, pediatric tertiary care hospital located in the urban setting of Chicago, Illinois. It is a mission-based organization committed to the health and wellness of all children. This vision is guided by the belief that all children need to grow up in a nurturing and protective environment in order to reach their fullest potential. In 2017, the pediatric organization implemented a strategic plan called Vision 2025 and set the goal

of achieving top tier pediatric organization status by 2025. This QI project aligns with another pillar of Vision 2025, which is to provide the best patient care and experience possible.

The needs of the organization are continually being evaluated and projects are prioritized to ensure alignment with the mission and vision of the organization. The problem of delays in medication PAs and the potential interventions has been reviewed with senior ambulatory nursing leadership and the ambulatory leadership team. These senior nursing leaders assisted in identifying potential interventions and agree that there is a need for further improvement.

Evaluating Change and Readiness for Change

The pediatric organization has the organizational capability and appropriate resources to support multiple interventions and is ready for change. It has committed resources to address the interventions suggested and has formed a centralized nursing team to complete PAs. This centralized team has already demonstrated improvement in reducing PA denials as well as PA medication turnaround time.

In addition to providing the necessary resources to address the suggested interventions, the pediatric organization also implemented an ePA system capable of integrating directly with the EHR and workflows. Strong internal data supported both interventions and the pediatric organization provided defined resources and support for the project and its interventions. The two projects were reviewed, scoped, and approved through the pediatric organizations EPMO team to ensure alignment with organizational mission and vision, and that resources such as information management, operations, and data analytics were scheduled during the planned implementation timeline.

Key leaders in the diabetes, allergy/pulmonary, and neurology/epilepsy centers agreed to the proposed interventions to optimize and evaluate user satisfaction with the recently

implemented ePA system. Team members were engaged to develop the measures and interventions required to address the problem of PA medication delays and denials in the specified pediatric chronic disease population.

The ePA implementation team consisted of our Chief Medical Information Officer, the Clinical Practice Directors for Endocrinology, Allergy, and Pulmonary, five front line chronic disease nurses, the nurse manager and director, information management EHR analysts, EHR training team, a clinical pharmacist who currently leads our centralized prior authorization team, the Senior Director for Digital Health, and the Director for Nursing Informatics and Innovation as well as the Ambulatory operations leadership team. This team will remain in place after implementation and will provide continued support for this QI project. Senior leadership (Chief Nursing Officer and Vice President of Ambulatory Services) are the sponsors for the ePA project and understood their roles in addressing barriers and in served as final decision makers.

Strengths and Weaknesses

The project steering team agreed that the strengths of the optimization intervention of the ePA system lie in reducing delays and denials receiving medications, which in turn is expected to improve clinical outcomes. Additionally, the investment could provide a cost savings to the organization in the form of reduced readmission rates, reduced emergency visits, reduced medication denial rates, and increased user adoption and satisfaction along with the more efficient use of organizational resources who process these PAs.

Alignment with the organization’s mission and vision is important to receiving the resources and support for a successful project outcome. Another strength aligning with the organization’s mission is that chronic diseases such as diabetes are strategic targets of the organization’s recent community health needs assessment. This assessment identified and

targeted underserved and under resourced communities on the west and south sides of Chicago and implemented local plans designed to improve patient access in an ongoing effort to prevent and treat diabetes.

One weakness within the pediatric organization was that the diabetes team is already stretched thin with involvement in multiple research and organizational projects. Additionally, the endocrine division was transitioning to new physician leadership, which could potentially change the direction and priorities of existing projects. There was the possibility that interventions to address delays and denials in medication PAs could be de-prioritized in favor of other competing projects. Additional threats included competing organizational resources such as information technology.

Memorandum of Understanding (MOU)

The memorandum of understanding (MOU) (Appendix F) is the agreement between the DNP student and the organization. It outlines the terms and understanding between the student at Boise State University and the pediatric organization. The reviewed, approved, and signed MOU for this QI project was signed by the principal investigator and the pediatric organizations chief nursing officer on December 22, 2020.

Interventions

Logic Model

The logic model by W.K. Kellogg Foundation (2006) provided the framework for evaluating and planning this QI project. As stated earlier, the focus of the logic model is to align resources, activities, and outputs to specific project outcomes. Outcome goals were developed using the SMART (specific, measurable, achievable, realistic, and timely) acronym. The key outputs for this project are:

1. An initial summative evaluation of the ePA system and corresponding report to stakeholders,
2. An informatics user adoption and satisfaction survey,
3. An optimization plan and implementation, and
4. A post optimization evaluation and user survey.

To achieve these outputs, several activities were accomplished.

1. A multidisciplinary steering team was organized with an initial meeting in April 2021.
2. Summative evaluation report of the ePA system was scheduled and reported to stakeholders in April 2021.
3. The plan to revise the algorithm for automatically verifying pharmacy benefits, reducing nuisance medications that require PA, and streamlining the workflow for the top 10 most frequently ordered PA medications was implemented in early June 2021.
4. An informatics user survey was selected and administered the first week of June 2021 and again after optimization in August 2021.

These project resources (team members) include ambulatory nurses in chronic disease specialties, providers, pharmacists, ambulatory operations leadership, clinical informaticists, EHR educators, and information technology (IT) specialists. A core team of leaders was organized, including ambulatory operations leadership made up of the nursing director and 3 managers, the IT EHR Manager, the pharmacy lead for the centralized authorization team, the physician clinical practice director for our diabetes program, an advanced practice professional

from another chronic disease specialty, the chief medical information officer, and the director of nursing clinical informatics.

The short- and long-term goals in the logic model format are listed in the table below:

Table 1. Short and Long-term Outcome Goals

	SHORT-TERM OUTCOME GOALS
#1	Initial evidence-based post IT project summative evaluation (clinical, operations, financial) reported to stakeholders by June 7th, 2021.
#2	Initial evidence based validated user survey administered to 75% of identified user community by June 7th, 2021
#3	58% of medications requiring PA receive approval on first PA submission by August 31st, 2021
#4	75% of medications requiring prior authorization are approved within 48 hours of order submission by August 31st, 2021.
#5	5% reduction in time taken from medication order to medication PA approval from baseline data by August 31st, 2021.
#6	75% of visits will have pharmacy benefits verified by August 31st, 2021.
#7	75% of users complete optimization education.
#8	Electronic medication AP system user adoption rate greater than 75% post optimization.
#9	Electronic medication PA system user satisfaction rate greater than 50% post optimization.
#10	Greater than 50% response rate to an electronic medication PA post implementation evaluation user survey post optimization.
	LONG-TERM OUTCOME GOALS
#18	Evidence based informatics project evaluation completed pre and post every electronic health records (EHR) project.
#19	Evidence based validated user surveys completed pre and post every EHR project.
#20	Improved disease status and chronic disease control, i.e. Glycemic control for diabetes patients, decreased seizures for epileptic patients.
#21	New users continue to utilize the electronic medication PA system at a rate higher than 80%.
#22	Consistent evaluation of user adoption and satisfaction after every EHR project.

Correlation of Interventions with Theoretical Model Elements and Phases

The Technology Acceptance Model (TAM) correlates IT system usage with its perceived usefulness. If users' perceptions of the usability and overall usefulness of the new ePA system are improved, increased usage of the ePA system should result, which in turn should reduce PA processing times. The Diffusion of Innovation (DoI) Model provides social behavior guidance on how informatics users will adopt new technology and suggests ways to enhance user acceptance. The initial intervention of a summative evaluation exploring PA processing times along with user adoption and user satisfaction provides baseline measurements of the effectiveness of the

ePA system. These two theoretical models may be related, as DoI early adopters may have a more positive perception of the usefulness of an innovation and therefore be more likely to use the ePA system. Conversely, users with less positive perceptions of an innovation's usefulness may be more likely to discount the system, using it less often. Implementing an optimization based on these initial evaluations may increase user adoption and satisfaction, resulting in reduced PA approval times and improved clinical outcomes for our chronic disease patients.

Timeline

A Gantt chart timeline is found in Appendix D. The key milestones are:

1. Planning: (October 2020–May 2021)—Organize core team, determine key performance measures, develop user satisfaction survey, develop detailed optimization plan.
2. Implementation: (June 2021–Aug 2021)—Optimization and pre/post survey.
3. Data Collection: (June 2021–Aug 2021)—Collection of key performance data and survey results.
4. Data Analysis: (June 2021–August 2021)—Analysis of key performance data and survey results.
5. Dissemination: (Fall of 2021) —Communication of final report and decision to publish.

Measures

The two most important data measures for the DNP SP are 1. the amount of time required for a medication requiring prior authorization from order to authorization approval (ePA turnaround time). 2. The nurses' user satisfaction with the ePA system. The source for the medication PA approval times will be the organization's EHR—Epic, from existing PA approval time reports. This data element will be measured pre- and post-intervention of electronic prior authorization system optimization. Verification of pharmacy benefits is key to enabling and

enhancing the effective use of the ePA system. Currently, this is being performed on 71% of visits at the pediatric organization. The optimization intervention will include revising the algorithm to automatically verify pharmacy insurance benefits. Therefore, pharmacy benefits verification will also be measured using existing EHR reports.

For the second data measure, user satisfaction will be collected using a survey questionnaire with a 5-point Likert scale question rating overall user satisfaction and providing interval-level data (Illowsky & Dean, 2018). This statistic will also be measured pre- and post-optimization intervention. There are many validated user satisfaction questionnaires, but none are specific to medication prior authorization APIs. The validated Doll and Torkzadeh User Involvement survey was adapted to be more specific to evaluating electronic medication prior authorization systems (Doll & Xia, 1997). This user involvement survey is further categorized as follows: content, accuracy, format, timeliness, ease of use, and overall satisfaction. The user Involvement survey questions, along with the user data points being collected in this QI project, are found in Appendix G. An additional data measure from this survey questionnaire is a single qualitative open-ended question within a free text comment field (Appendix H). A complete Outcomes Evaluation Table can be found in Appendix I.

Analysis

Quantitative Analysis

Both descriptive and inferential statistical analysis were used as data measures for this QI project. Descriptive statistics was used to analyze the electronic prior authorization process and user satisfaction. The first data point compared the central tendency measure of median ePA approval times before and after the intervention of an optimization to the electronic prior authorization process. The median ePA turnaround time data was used rather than the average, in

alignment with benchmark reports set by other organizations. The second data point evaluated the percentage approval rate of ePA submission while a third data point analyzed the percentage of visits with pre-verification of pharmacy benefits. Data collected using these sources and collection methods, along with descriptive statistical analysis, determined the effectiveness of the optimization intervention.

Qualitative Analysis

For this QI project, qualitative user experience data was collected using an open-ended question. The data collected was grouped by user satisfaction and user adoption, with subcategories of perceptions of specific portions of the ePA process and EHR functionality. The qualitative survey data was grouped based on topics to identify opportunities for correcting the process and improving final outcomes.

Accuracy, feasibility, utility, propriety, and accountability standards were applied when collecting and analyzing qualitative data (Newcomer et al., 2015). To remove the project manager from any potential reviewer bias concerns, the survey itself was administered by a nurse on the pediatric organizations Clinical Informatics team. The project team was trained on the processes required to maintain privacy, confidentiality, and transparency, along with maintaining quality (accuracy) of data collection. This QI project was reviewed by the sponsoring organization's Institutional Review Board and the project team was held accountable for maintaining evaluation standards.

Ethical Considerations

Protection of Participants

Ethical considerations to protect project participants' privacy and confidentiality are paramount to this project. The project participants are the users of the electronic medication PA

system. This author completed Collaborative Institutional Training Initiative (CITI) on human subject research in July 2020. Based on the CITI training, the core principles of informed consent, voluntary participation, confidentiality, privacy, do no harm, and assessing only relevant components of information will be complied with during all phases of this project. One ethical risk is coercion, as this author supervises the nursing staff who use the electronic PA system. Consequently, nursing staff may feel obligated or compelled to use the system or be biased in survey feedback and response. However, according to CITI training, this project is considered low risk as it is primarily considered a quality improvement project—one using de-identified data and not requiring informed consent.

Further, the author avoided using identifiable data and used only the minimum amount of relevant data required to complete the project. Patients' medication PA time data was retrieved as de-identified data from the secure EHR in compliance with the pediatric organizations institutional data resource policy and in compliance with the Health Insurance Portability and Accountability Act (HIPAA). User survey data was de-identified as much as possible to further ensure privacy and confidentiality.

Conflicts of Interest

This author has no conflicts of interest to disclose. There are no financial considerations or other benefits from any of the initiatives selected. The author maintains no conflicts related to electronic PA system product utilization, pharmacy benefits insurances, validated survey vendor, or pharmacies.

Biases

There are several potential biases for this project, among them the inherent biases and social aspects of adopting and accepting new technology. Per the Diffusion of Innovation theory,

some users may be early adopters, encouraging others to use the new ePA system, while others may be laggards who never adopt the innovation. There may also be a social desirability bias, where user survey respondents may be biased to answer questions in ways they perceive will be viewed favorably by others in their social community. There may be a bias toward the prior system of faxes, phone calls, and online portals for processing PA medications as well. These biases may impact survey participation rates, honesty of responses, and hamper optimization improvement efforts.

Threats to Quality

Quality threats identified for this project include missing or incomplete data, concerns with reliability and validity of the data measured, and low survey participation rates. The primary data source for medication prior authorization processing times will be the pediatric organizations EHR and its integration with the electronic PA application program interface. This is a possible threat to reliability as unplanned service interruptions in either system could result in corrupt or incomplete data. The two user surveys and optimization education could also be negatively impacted by low participation rates. The survey tool selected and the method by which the survey is conducted will need be validated to ensure that appropriate information is being captured without bias.

IRB Application and Project Determination

This QI project was presented to the pediatric organization's Institutional Review Board (IRB) for determination on January 26, 2021, and a Letter of Determination indicating that this project met criteria for Quality Improvement (QI) was issued on February 11, 2021. Per the pediatric organizations existing policy, this QI project does not meet the definition of human subject research and does not require IRB review or informed consent for participation.

Project Budget

The resources required to support and sustain this QI project over a 3-year budget period are detailed in three documents: a 2–3-year projected Budget (Appendix J), Expense report (Appendix K), and a Statement of Operations (Appendix L). Key elements of this QI project are the implementation of a user satisfaction survey pre- and post-intervention and three interventions: two information technology (IT) interventions and one operational optimization of the ePA system. The expense report details the labor expenses required to support these interventions. The primary labor components are the project steering team, the IT analysts who support ePA system integration within the electronic health record (EHR), data and reporting resources, and EHR educators. All budget resources are considered organizational and are to be provided in-kind from the pediatric organization.

Sustainability

To sustain this QI project financially into the second and third year and to continue to evaluate the outcomes and recommend possible further interventions, project management labor and minimal project steering team labor are required. There are also yearly IT interface fees currently being evaluated to determine whether they fall under this QI project budget. The three-year projected cost is $24,535.50. This QI project was not designed to generate revenue and since the primary source of revenue will be in-kind donation, the resulting operating income will be $0 as detailed in the Statement of Operations.

Continuous quality improvement should be sustained within the QI project through yearly reviews and technical and operational optimizations to the ePA system. These reviews and optimizations should occur in conjunction with the centralized prior authorization team, as this

will provide the most thorough assessment of the systems in place to address patient delays in receiving PA medications.

Results

Steps of the Interventions

The quality improvement kick-off meeting was held on April 30, 2021, with the steering team representing ambulatory nursing operations, clinical informatics, information management, information technology (interface lead), pharmacy informatics, clinical physicians, the centralized prior authorization team, and frontline ambulatory nurses. The organization's ePA summative reports on turnaround times, approval rates, and pharmacy benefit insurance with patient validation rates were presented as baseline data. User involvement survey questions and demographics questions were proposed and approved with only one change (adding the question of "how many years of experience do you have completing medication prior authorizations").

Three optimization interventions were proposed and approved:

1. Reduce medications falsely requiring PA
2. Increase the patient-pharmacy benefits auto validation rate
3. Optimize the workflow for attaching documents within the ePA.

An informatics nurse emailed the pre-intervention user involvement survey to 100% (n=194) of the ambulatory nurses on May 5, 2021 and sent a follow-up reminder on May 24, 2021. The pre-intervention survey period ended on June 1, 2021. There were three meetings with staff from the following specialties: endocrine (diabetes educator), psychiatry, and the centralized prior authorization team. At the meetings, participants provided feedback on improving the ePA workflow along with specific interventions to improve the process of attaching documents to ePA communication.

The nursing informatics consultant sent the post optimization user involvement survey on August 3, and a reminder email was sent on August 23. Due to a very low response rate, the Chief Nursing Officer sent a third email reminder on August 27, 2021, and extended the deadline to September 7.

Interventions

The optimization included three interventions to the ePA system.

1. Reduce medications falsely requiring PA by removing them from being processed in the CoverMyMeds application program interface (API).
2. Increase the pharmacy insurance verification rates by modifying patient matching validation criteria.
3. Modify the process of attaching data from the EHR into the ePA communication, improving workflow efficiency.

A report identified 38 medications often flagged erroneously as requiring PA, most of them over the counter (OTC) medications. Most OTC medications require medication PA because patients can obtain them over the counter and pay out of pocket (not paid for by pharmacy benefits). The specific intervention excluded the 38 medications from requiring ePA in the Epic EHR. See Appendix M for the specific list of medications excluded from ePA.

For the ePA system to work, the first step must be to verify the patients' pharmacy benefits. The EHR and pharmacy benefits vendor are electronically interfaced and attempt to automatically match patients with their respective pharmacy benefits insurance through a validation algorithm. This validation is automatically completed every morning prior to the scheduled patient visit appointments. The interface report revealed that over the period of March to early June 2021, an average of 40 interface errors occurred per day in attempting to match

patients to their pharmacy benefits. The matching rate prior to the interventions was approximately 70% of scheduled patient visits. The interventions modified the patient matching validation logic by removing the "gender" criteria from the EHR interface with the goal of increasing this automatic matching rate 5% by August 2021. Refer to Appendix N for screenshots of the Interface Validation Changes completed in the Epic interface.

The third optimization intervention was to improve operational workflow efficiency within the ePA system. Small group meetings with frontline nurses revealed a multi-step workflow for attaching documents to the ePA system:

1. Copy all specific parts of the patient's EHR record.
2. Paste into a Microsoft Word document
3. Modify Word document as needed by removing/adding sections
4. Print the Word document
5. Scan the printed document
6. Retrieve the scanned document from email and save/rename to a secure drive.
7. Attach the document to the ePA communication.

Working with frontline staff, the team developed a new workflow with fewer steps, thus reducing the amount of time it took to attach documents to ePA communications. Ambulatory nurses were instructed on best practices for attaching the documents and were educated on the new workflow and This intervention was implemented on June 21st, 20221. Please refer to Appendix O—Attaching Documentation to ePA Communication.

Study of Interventions

Pre-Optimization Study of Interventions

The 13-question user involvement survey was completed on June 1st, 2021, prior to the implementation of the optimization interventions and provided baseline user satisfaction and adoption information.

There were 57 responses with the following demographic breakdown. Survey respondents averaged 16 years of experience with a range of 2–46 years. Their average years of experience completing PAs were 5.7 years with a range of 0–25 years. Respondents reported completing PAs two times a week on average with a range of 0–10 times a week. By specialty primary care pediatrics logged the highest response rate at seven total.

A twelve-question user involvement survey using a five-point Likert scale was completed by 51 respondents. The pre- and post-optimization involvement survey results are graphed in the figure found in Appendix Q. Most respondents (51%) reported that the system was not user friendly and 49% reported dissatisfaction with system accuracy. The two questions with the highest satisfaction rates were “does the system provide the information you need?” and “is the information clear?” with respective satisfied scores of 46% and 39%.

The ePA initiated volumes have steadily increased from December 2020–March 2021 with the highest mark in March at 1,136 PAs while the ePA median turnaround times have remained steady at around 36 hours over the same period. The overall approval rate averaged 54% from October 2020–March 2021.

Post Optimization Study of Interventions

The 13-question post optimization user involvement survey was completed on September 7th, 2021. There were 16 responses with demographics as follows. Survey respondents had an average 18.8 years of experience years with a range of 4–40 years. They averaged 6.6 years of experience completing PAs with a range of 0–20 years. Respondents reported completing PAs

seven times per week on average with a range of 0–60 times per week. By specialty, pulmonary/sleep medicine respondents had the highest response rate at three total. For a summary of this information, refer to appendices P and R.

A twelve-question user involvement survey using a five-point Likert scale was completed by 16 respondents. The post optimization involvement survey results are graphed in the figure found in Appendix N. Most respondents (53%) reported that the system was not user friendly and 51% reported that they were dissatisfied with its accuracy. The two questions with the highest satisfaction rating were “does the system provide the information you need?” and “is the information clear?” with respective scores of 40% and 36% satisfied.

The ePA initiated volumes slightly increased during the optimization intervention period of June–August 2021 with the highest mark in June of 1,313 PAs while the ePA median turnaround times remained stagnant at around 36 hours over the same period. The overall approval rate dropped from 55% to 47% at the end of the August 2021 optimization period.

Contextual Elements Interacting with the Interventions

The implementation of the ePA system in August 2020, coincided with the global COVID-19 pandemic, during which time inpatient and emergency department patient visit volumes dropped by roughly 50% while outpatient visit volumes declined by roughly 10%. Many in-person outpatient visits were replaced with telemedicine appointments, which peaked at roughly 70% of outpatient visits during the month of April 2021. This drop in inpatient admissions led to significant financial strain on the pediatric organization, resulting in implementation of a financial recovery plan that saw a 10% workforce reduction and unpaid 6-week furloughs for all organization employees. Despite less impact on outpatient visit volumes, the furloughs and reduction in workforce increased the strain on ambulatory nurses, who were

often short staffed. Initial ePA implementation was delayed by 4 weeks due to the strain on Information Management (IM) project resources and ambulatory nurses.

The interventions of this project were implemented during the months of May through August 2021, just as outpatient visit volumes returned to pre-pandemic levels. As vaccination rates increased and Chicago relaxed COVID precautions, a surge of patients returned for in-person healthcare and some divisions experienced 17% higher visit volumes without a corresponding increase in staffing. The steady increase in ePA volume during the winter of 2020 going into 2021 continues to strain ambulatory nursing resources, resulting in lower employee engagement scores and possibly resulting in stagnant ePA turnaround times pre optimization intervention.

An unplanned EHR upgrade was performed mid-July and impacted the operational intervention for improving the workflow for document attachment. The upgrade turned the EHR PA Details webpage containing document attachment instructions into a dynamic weblink, resulting in confusion over correct processes and workflow best practice's location. The training document was not corrected until the end of August, which may have reduced utilization of the ePA API system.

Discussion

Summary

The final report on desired outcomes post interventions shows that the majority of the outcome goals were not met. The primary outcome goal of reducing turnaround time for medications requiring prior authorization remained at 36 hours, while the approval rate at the end of the observation period in August 2021 dropped from 55% to 47%. Each optimization intervention was intended to increase overall use of the ePA system, thereby reducing the

amount of time taken for patients to receive their PA medications. The following table outlines the interventions along with desired short-term outcomes and results. While interventions to increase the availability of the ePA system by increasing the auto verification rate of pharmacy benefits were successful at 75%, there was only a slight increase in overall PA submissions from June–August 2021. See Appendices S and T—ePA Volumes and Turnaround Times Report Pre and Post Optimization.

An overall summary table of interventions and short-term related outcomes is depicted in Table 2 below. Table 3 illustrates the optimization ePA metrics, with the intervention and implementation period highlighted.

Table 2*:*

Summary Table of Interventions and Short-Term Related Outcomes

	Goal #	Intervention	Met/Unmet Date
1	Initial evidence based post IT project summative evaluation (clinical, operations, financial) reported to stakeholders by June 7th, 2021	Summative evaluation—Kickoff meeting	Met April 30th, 2021
2	Initial evidence-based validated user survey administered to 75% of identified user community by June 7th, 2021.	Pre-Optimization Survey	Met 100% (194/194) received the email. Return rate 57/194
3	58% of medications requiring PA are approved by August 31st, 2021.	3 Optimization Interventions	Not Met 46% August 2021
4	75% of medications requiring PA are approved within 48 hours of order submission by August 31st, 2021.	3 Optimization Interventions	Not Met 65% August 2021
5	5% reduction in time taken from medication order to medication PA approval from baseline data by August 31st, 2021.	3 Optimization Interventions	Not Met 36 hours—August 2021
6	75% of visits will have pharmacy benefits verified by August 31st, 2021	Pharmacy benefits validation optimization	Met 75.2% September 2021
7	75% of users complete optimization education	Attaching documents optimization	Not Met 45%
8	Electronic medication PA system user adoption rate greater than 75% post optimization	3 Optimization Interventions	Not Met
9	Electronic medication PA system user satisfaction rate greater than 50% post optimization	3 Optimization Interventions	Not Met –80% August

10	Greater than 50% response rate to an electronic medication PA post implementation evaluation user survey post optimization	Post optimization survey	Not Met 8% (16/194) post intervention response rate.

Table 3:

Optimization ePA Metrics. Intervention period highlighted in dark.

Measure	January 2021	February 2021	March 2021	April 2021	May 2021	June 2021	July 2021	August 2021
PA's Initiated	890	1,093	1,136	1,133	1,143	1,313	1,130	1,251
Ambulatory Visit Volume *(excludes medical imaging, diagnostics testing and rehab)*	24,748	25,434	29,521	28,111	27,225	29,777	27,121	28,447
ePA/Visit Ratio	3.6%	4.3%	3.8%	4%	4.2%	4.4%	4.2%	4.4%
Median Turnaround Time	35	36	36	38	37	36	38	36
ePA Approval Rate	54.8%	54.2%	52.7%	55.27%	55%	**55.7%**	**46%**	**46.9%**
% of ambulatory visits with pharmacy benefits auto verified	NA	NA	NA	70%	71%	**74%**	**76%**	**75%**

Comparison of pre- and post-intervention user satisfaction surveys revealed a drop in the survey participation rate from 29% to 8%, with a significant drop in overall user satisfaction measured as the Net Promotor Score (NPS) fell from –70 to –82. The lowest ratings continued to be regarding the accuracy and timeliness of the system in both pre and post surveys. The open-ended free text question also relayed the same issues with accuracy and timeliness of the ePA API.

The overall project expenses came in under budget as additional EHR interface engineer time was not needed to implement the new inbound/outbound interfaces. There is also no expense for data and reporting analyst time as pre-existing reports from CoverMyMeds and the EHR met the needs of this quality project. A summative report was sent out to the project team and stakeholders in December 2021.

Interpretation

Association between Interventions and Outcomes

The intervention of increasing the pharmacy benefits auto validation rate was intended to be a leading indicator for reducing the medication PA turnaround time. It was felt that increasing the availability of the ePA API in clinic visits would allow the ePA system to be utilized more often, therefore decreasing medication turnaround times. Though the intervention to increase the pharmacy benefits validation rate was achieved at 75% of ambulatory visits, this did not appear to translate to increased utilization of the ePA system because the ratio of PA to visits remained constant around 4% during the June–August observation period.

The intervention to reduce the number of medications falsely requiring prior authorization had mixed results. This intervention was designed to reduce the administrative burden of completing PAs for medications not requiring authorization. This intervention may instead have resulted in an unintended reduction of the authorization approval rate. Further examination of the decreasing approval rate found that many of the medications removed from requiring PA were approved at a high percentage rate in prior months. Removing these medications from the denominator of approved ePAs possibly resulted in an overall lower approval percentage.

The operational improvement intervention of attaching documents contributed to an increase in approved authorizations in the first month's post intervention but had to be changed in mid-July due to an EHR upgrade which moved the prior authorization details page into a separate screen without documentation or explanation, causing confusion among users. A new workflow needs to be developed to incorporate this change in EHR.

The user satisfaction post intervention results demonstrate dissatisfaction with the ePA API system. Based on the feedback broken out into different informatics subjects (accuracy, usability, timeliness, format), the ambulatory nurses are highly dissatisfied with the ePA system.

The use of an alternative electronic medication prior authorization system was not included in the quality improvement project. The ePA API vendor, CoverMyMeds (CMM) also offers an online portal for completing prior authorizations. This online portal is an approved system for the organization's nurses to use and the pediatric organization does maintain a separate contract with CMM for its use. During the intervention and monitoring period, utilization of the ePA API system was compared to the CMM online portal, and the PAs created by month in the online portal averaged 862 from June–August 2021, which is a little less per month than the ePA API, but the authorization rates for the CMM online system are significantly higher at an average of 73% during the same time period. Based on responses to the open-ended question at the end of the survey, nurse users found the online portal to be more accurate, timelier, and easier to use than the integrated ePA system. There were negative comments regarding the inability of multiple users to track an ePA in the integrated system, along with it being more difficult to revise an ePA versus having to completely cancel an ePA in comparisons of the two PA systems. Again, this quality improvement project did not intend to compare the integrated ePA system with the online CMM portal PA system but, considering the impact of this alternative medication PA system, comparisons should be included in future project work.

Limitations

The quality of the post optimization survey results may have a negative response bias due to the low percentage response rate (8%). The low rate may only represent the most negative survey responses and there may also be an element of non-response bias. As stated earlier,

ambulatory nurses are currently stretched thin due to high patient volumes and acuity, which may have contributed to their non-responses to this follow up post optimization survey. The survey end date was extended by 10 days from August 27th to September 7th, 2021, to help accommodate for this response rate concern.

Another possible limitation is the ability to replicate and generalize this QI project. While the general process of evaluating an existing healthcare informatics system, obtaining user satisfaction information to inform interventions, then measuring for success can be applied to other informatics projects, the technical specifics that vary between informatics projects may be difficult to scale. At a strategic decision-making level, the opportunity costs may not allow for this general process to be resourced.

Policy Implications

There are several levels of policy that govern the use of the ePA system and are considered with this QI project. At an organizational level, health information management policy defines the rules and regulations for using and maintaining the electronic health record to assure the health, safety, and security of the data and the staff who use it. These policies are also aimed at protecting the organization from legal risk. Many of these rules and regulations are designed and programmed into information systems to comply with policies, while others are managed through operations. With this QI project, patient identification and pharmacy benefits interface settings were changed in compliance with IT policy.

At a national and international level, policies promoting interoperability and standard electronic communication while complying with government policy such as the Health Information Portability and Accountability Act (HIPAA) and the Medicare Prescription Drug, Improvement, and Modernization Act are required. The integrated ePA system that was

optimized with this QI project is in full compliance with the National Council for Prescription Drug Programs SCRIPT Electronic Prior Authorization Transaction Standards established in 2015 (NCPDP, 2015). The NCPDP is a not for profit, quality accredited, standards development organization with members representing all aspects of the pharmacy industry—pharmacies, payors, and healthcare organizations. The NCPDP SCRIPT ePA sets standard electronic definitions and transactions for patient identification, prescribing, dispensing, insurance verification, and payment and is approved by the U.S. Department of Health and Human Services.

A clinical level of policies defining clinical operational workflows was also taken into account. Nursing policies such as the medication refill protocol allow registered nurses to refill most medications electronically. These nursing protocols are reviewed and approved by the pediatric organizations Medical Executive Board and are organizational level policies. Documentation standards are in place requiring attaching clinical documentation to the ePA request and impacting the operational optimization for attaching documents to ePAs.

Conclusion

Though most of the outcome goals were not met with this QI project, these results, and the unintended comparison of the two medication PA systems, demonstrate that informatics users will naturally gravitate toward the system they perceive to better meet their needs. This behavior aligns with the Technology Acceptance Model theory and may be valuable in predicting user satisfaction and user adoption of clinical informatics tools. Understanding user behavior with informatics software is valuable when implementing healthcare QI projects.

One of the strengths of this QI project was the high engagement of the ambulatory nurses and the clinical/ information management teams. The ambulatory nurses, information

management analysts, and the CMM project team brainstormed proposed interventions and quickly designed, built, and implemented them within a couple of weeks. The ambulatory nurses were remarkable in their ability to complete these ePAs even with high patient volumes and staffing shortages. Having an engaged and educated staff, an organizational culture and infrastructure to support innovation, and a quality improvement project with identified outcome measures are all factors that support sustainability (Mortimer et al., 2018). Sustainability is a critical part of any QI project, and not evaluating sustainability will result in leaders repeating mistakes and diminishing return on value.

Assessing user satisfaction to inform optimization interventions may be a sustainable practice for future informatics projects but will be dependent on whether the resource needs are worth the return on value. User involvement surveys are useful tools for evaluating satisfaction and utilization, but risks such as survey fatigue are of concern, especially in constrained resource environments such as healthcare. Overall, this QI project is sustainable to scale to other health informatics projects at the pediatric organization. The pediatric organization has the right environment, with the project management infrastructure and support, a culture for excellence, and an engaged workforce for long term sustainability of informatics QI projects.

References

2018 Prior Authorization Physician Survey. (n.d.). https://www.ama-assn.org/system/files/2019-02/prior-auth-2018.pdf

Academy of Managed Care Pharmacy Professional Practice Committee. (2019). Prior authorization and utilization management concepts in managed care pharmacy. *Journal of Managed Care & Specialty Pharmacy*. https://doi.org/10.18553/jmcp.2019.19069

Ackman, M. L., Graham, M. M., Hui, C., & Tsuyuki, R. T. (2006). Effect of a prior authorization process on antiplatelet therapy and outcomes in the patients prescribed clopidogrel following coronary stenting. *Canadian Journal of Cardiology*. https://doi.org/10.1016/S0828-282X(06)70960-6

American Medical Association. (2019). *Consensus statement on improving the prior authorization process*. https://www.ama-assn.org/sites/ama-assn.org/files/corp/media-browser/public/arc-public/prior-authorization-consensus-statement.pdf

Ancker, J. S., Kern, L. M., Abramson, E., & Kaushal, R. (2012). The Triangle Model for evaluating the effect of health information technology on healthcare quality and safety. *Journal of American Medical Informatics Association*, (19), 61–65. https://doi.org/10.1136/amiajnl-2011-000385

Asif, M. (n.d.). The prevention and control the type-2 diabetes by changing lifestyle and dietary pattern. *The Journal for Education and Health Promotion*. https://doi.org/10.4103/22777-9531.127541

Attention-deficit/hyperactivity disorder (ADHD). (n.d.). Centers for Disease Control and Prevention. https://www.cdc.gov/ncbddd/adhd/facts.html

Atkins, M. S., Rusch, D., Mehta, T. G., & Lakind, D. (n.d.). Future directions for dissemination and implementation science: aligning ecological theory and public health to close the research to practice gap. *Journal of Clinical Child & Adolescent Psychology*. https://doi.org/10.1080/15374416.2015.1050724

Bergeson, J. G., Worley, K., Louder, A., Ward, M., & Graham, J. (2013). Retrospective database analysis of the impact of prior authorization for type 2 diabetes medications on health care costs in a medicare advantage prescription drug plan population. *Journal of Managed Care & Specialty Pharmacy*, *19*(5), 374–384.. https://doi.org/10.18553/jmcp.2013.19.5.374

Bhattacharjee, S., Murcko, A. C., Fair, M. K., & Warholak, T. L. (2019). Medication prior authorization from the providers perspective: a prospective observational study. *Research in Social and Administrative Pharmacy*. https://doi.org/10.1016/j.sapharm.2018.09.019

Cho, H., Yen, P.-Y., Dowding, D., Merrill, J. A., & Schnall, R. (2018). A multi-level usability evaluation of mobile health applications: A case study. *Journal of Biomedical Informatics*, *86*, 79–89.. https://doi.org/10.1016/j.jbi.2018.08.012

Cresswell, K., & Sheikh, A. (2013). Organizational issues in the implementation and adoption of health information technology innovations: An interpretative review. *International Journal of Medical Informatics*. https://doi.org/10.1016/j.ijmedinf.2012.10.007

Currie, L. M. (2005). Evaluation frameworks for nursing informatics. *International Journal of Medical Informatics*, *74*, 908–916. https://doi.org/10.1016/j.ijmedinf.2005.07.007

Cutler, T., She, Y., Barca, J., Lester, S., Xing, G., Patel, J., & Melnikow, J. (2016). Impact of pharmacy intervention on prior authorization success and efficiency at a University

Medical Center. *Journal of Managed Care & Specialty Pharmacy*. https://doi.org/10.18553/jmcp.2016.22.10.1167

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, *35*(8), 982–1003. https://doi.org/10.1287/mnsc.35.8.982

Dang, D., & Dearholt, S. L. (2018). *John Hopkins nursing evidence-based practice: Model and guidelines* (3rd ed.). Sigma Theta Tau International.

Doll, W. J., & Xia, W. (1997). Confirmatory factor analysis of the end-user computing satisfaction instrument. *Journal of Organizational and End User Computing*, *9*(2), 24–31. https://doi.org/10.4018/joeuc.1997040103

Dunn, E. E., Vranek, K., Hynicka, L. M., Gripshover, J., Potosky, D., & Mattingly II, J. (2017). Evaluating a collaborative approach to improve prior authorization efficiency in the treatment of the hepatitis C virus. *Quality Management in Health Care*. Retrieved February 17, 2020. https://doi.org/10.1097/QMH.0000000000000137

Estrada, C. L., Danielson, K. K., Drum, M. L., & Lipton, R. B. (2009). Hospitalization subsequent to diagnosis in young patients with diabetes in Chicago, Illinois. *Pediatrics*, 926–934. https://doi.org/10.1542/peds.2008-3826

Fagot-Campagna, A., Pettitt, D. J., Engelgau, M. M., Burrows, N. R., Geiss, L. S., Valdez, R., Beckles, G. L., Saaddine, J., Gregg, E. W., Williamson, D. F., & Narayan, K. (2000). Type 2 diabetes among North adolescents: an epidemiologic health perspective. *The Journal of Pediatrics*, *136*(5), 664–672. https://doi.org/10.1067/mpd.2000.105141

Kaplan, B. (2001). Evaluating informatics applications—clinical decision support systems literature review. *International Journal of Medical Informatics*, *64*(1), 15–37. https://doi.org/10.1016/S1386-5056(01)00183-6

Mayer-Davis, E. J., Lawrence, J. M., Dabelea, D., Divers, J., Isom, S., Dolan, L., Imperatore, G., Marcovina, S., Pettitt, D. J., Pihoker, C., & Saydah, S. (2017). Incidence trends of type 1 and type 2 diabetes among youths, 2002-2012. *The New England Journal of Medicine*, (376), 1419–1429. https://doi.org/10.1056/NEJMoa1610187

NCPDP SCRIPT Electronic prior authorization (ePA) fact sheet (2015). September 11, 2021. https://www.ncpdp.org/NCPDP/media/pdf/NCPDP_ePA_Fact_sheet.doc

Popatia, S., Flood, K. S., Golbari, N. M., Patel, P. V., Olbricht, S. M., Kimball, A. B., & Porter, M. L. (2019). Examining the prior authorization process, patient outcomes, and the impact of a pharmacy intervention: A single-center review. *Journal of the American Academy of Dermatalogy*. https://doi.org/10.1016/j.jaad.2019.05.024

Portz, J. D., Bayliss, E. A., Bull, S., Boxer, R. S., Bekelman, D. B., Gleason, K., & Czaja, S. (2019). Using the technology acceptance model to explore user experience, intent to use, and behavior of a patient portal among older adults with multiple chronic conditions: Descriptive qualitative study. *Journal of Medical Internet Research*, *21*(4). https://doi.org/10.2196/11604

Resnick, J. S. (2020). Refocusing medication prior authorization on its intended purpose. *Journal of the America Medical Association*. *JAMA*. https://doi.org/10.1001/jama.2019.21428

Reinehr, T. (2013). Type 2 diabetes mellitus in children and adolescents. *World Journal of Diabetes*, *4*. https://doi.org/PMC3874486

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). Free Press.

Shah, D., Tongbram, V., & Paly, V. (2014). Impact of prior authorization restrictions on resource utilization and costs in US health plans: a review of literature. *Value in Health*. https://doi.org/10.1016/j.jval.2014.08.1019

U.S. Department of Health and Human Services-Office of the Inspector General. (2019). *Some Medicare Part D. beneficiaries face avoidable extra steps that can delay or prevent access to prescribed drugs* (OEI-09-16-00411). https://oig.hhs.gov/oei/reports/oei-09-16-00411.pdf

Van Cleave, J., Gortmaker, S. L., & Perrin, J. M. (2010). Dynamics of obesity and chronic health conditions among children and youth. *JAMA, 303*(7), 623–630. https://doi.org/10.1001/jama.2010.104

Viswanathan, M., Golin, C. E., Jones, C. D., Ashok, M., Blalock, S. J., Wines, R. C., Coker-Schwimmer, E. J., Rosen, D. L., Sista, P., & Lohr, K. N. (2012). Interventions to improve adherence to self-administered medication for chronic disease in the United States: a systematic review. *Annals of Internal Medicine*, *11*, 785–795. https://doi.org/10.7326/0003-4819-157-11-201212040-00538

W. K. Kellogg. (2006, February 2). *Logic Model Development Guide (LMDG)*. www.wkkf.org. https://www.wkkf.org/resource-directory/resource/2006/02/wk-kellogg-foundation-logic-model-development-guide

Wallace, Z. S., Harkness, T., Fu, X., Stone, J. H., Choi, H. K., & Walensky, R. P. (2019). Treatment delays associated with prior authorization for infusible medications: a cohort study. *Arthritis Care and Research*. https://doi.org/10.1002/acr.24062

Wirrell, E. C., Vanderwiel, A. J., Nickels, L., Vanderwiel, S. L., & Nickels, K. C. (2018). Impact of prior authorization of antiepileptic drugs in children with epilepsy. *Pediatric Neurology*. https://doi.org/10.1016/j.pediatrneurol.2018.03.006

Zaccagnini, M. E., & Pechacek, J. M. (2021). *The doctor of nursing practice essentials: A new model for advanced practice nursing* (4th ed.). Jones & Bartlett.

Zack, M. M., & Kobau, R. (2015). National and state estimates of numbers of adults and children with active epilepsy-United States, 2015. *MMWR Morbidity and Mortality Weekly Report*, *66*(31), 821–825. https://doi.org/10.15585/mmwr.mm6631a1

Appendix A

Literature Review Table

TITLE OF ARTICLE	AUTHORS	RESEARCH QUESTION OR AIM OF THE ARTICLE	TYPE OF STUDY (DESIGN)	LEVEL OF EVIDENCE	DESCRIPTION OF SAMPLE	OUTCOME MEASURES	RESULTS / KEY FINDINGS
Impact of Medication Prior Authorization on Clinical Outcomes							
Retrospective database analysis of the impact of prior authorization for type 2 diabetes medications on health care costs in a Medicare Advantage prescription drug plan population. (2013)	Bergeson, Worley, Louder, Ward, & Graham (2013)	To examine the relationship between receiving Type 2 diabetes medication requiring PA, health care costs, and subsequent treatment for type 2 diabetes.	Non-experimental (quantitative) time dimensional descriptive retrospective cohort	Research-Level III. High quality	Pharmacy, medical and laboratory claims data from 4,101 Medicare Advantage Prescription Drug Plan members who receive Type 2 Diabetes medications requiring PA. Time period: Jan.1, 2008-June 30, 2009.	Participants were broken into 2 cohort groups, those receiving PA approval and those denied approval.. Overall pharmacy costs, overall healthcare costs, and whether participants-maintained therapy were measured.	Overall healthcare and pharmacy costs for those who received PA approval was lower and statistically significant. Those with approved PAs also maintained current therapy at a higher rate. Relevant, current, reliable primary source and specific to the chronic disease problem statement. Suggests health plans consider impact of utilization management strategies on reducing pharmacy costs along with the broader implications for healthcare costs and treatment patterns among members.
Impact of prior authorization (PA) of antiepileptic drugs in children with epilepsy (2018)	Wirrell, Vanderwiel, (2018).	Assessed how common medications requiring prior authorization could result in treatment delay or missed doses in children with epilepsy.	Non-experimental (quantitative) time dimensional descriptive retrospective cohort	Research-Level III. High quality	Parents of 462 children with epilepsy surveyed, 164 survey responses in this single institution	Number of missed doses of the anti-epileptic medications. Number of patients that had increased seizures.	Medication PA of anti-epileptic drugs often results in delays in medication therapy with negative impacts on seizure control. Relevant, current, reliable primary source

TITLE OF ARTICLE	AUTHORS	RESEARCH QUESTION OR AIM OF THE ARTICLE	TYPE OF STUDY (DESIGN)	LEVEL OF EVIDENCE	DESCRIPTION OF SAMPLE	OUTCOME MEASURES	RESULTS / KEY FINDINGS
						Number of patients requiring admission for status epilepticus	and specific to chronic disease problem statement.
Effect of a prior authorization process on antiplatelet therapy and outcomes in patients prescribed clopidogrel following coronary stenting (2006)	Ackman, Graham, Hui, Tsuyuki .	To determine the effect of a policy change in medication coverage for clopidogrel on patients' filling of prescriptions and outcomes following stent insertion.	Non-experimental (quantitative) time dimensional descriptive retrospective cohort	Research-Level III. High quality	Study sample of 112 patients over the age of 65 years who received an intra-coronary stent and were prescribed the anti-platelet medication clopidogrel.	Days between order to pharmacy fill. Number of patients who experienced a myocardial infarction and /or required revascularization procedures.	Medication PA may delay patient access to necessary medications resulting in significant potential for negative clinical consequences. Relevant, NOT current, reliable primary source. Specific to chronic disease problem statement.
PHP84 - Impact of prior authorization restrictions on resource utilization and costs in US health plans: a review of literature (2014)	Shah, Tongbram, Paly.	A review of published peer-reviewed literature was conducted to evaluate the impact of prior authorizations, restrictions on resource utilization, and costs.	Literature review	Non-Research-Level V High quality	Targeted review of literature in Medline resulted in 14 studies that met inclusion criteria.	Resource utilization and cost of medications. Clinical safety and quality of life data specific to the 14 studies.	Medication PA restrictions may result in cost-savings, but patient safety and quality of life concerns must also be evaluated while imposing these restrictions. Relevant, current, reliable primary source and specific to chronic disease problem statement.
Treatment delays associated with prior authorization for infusible medications: a cohort study (2019)	Wallace, Harkness, Fu, Stone, Choi, Walensky.	Examine the effects prior authorizations (PA) requirements have on patient-oriented outcomes with rheumatologic disorders.	Non-experimental (quantitative) retrospective cohort	Research-Level III. High quality	225 rheumatology patients prescribed biologic medications in a single academic institution.	Number of days between medication order and medication infusion. Proportion of denied PAs. Number of days on glucocorticoid steroids while awaiting infused biologics.	Medication prior authorizations are associated with treatment delays and denials, and with greater glucocorticoid exposure Relevant, current, reliable primary source and specific to the chronic disease problem statement.

TITLE OF ARTICLE	AUTHORS	RESEARCH QUESTION OR AIM OF THE ARTICLE	TYPE OF STUDY (DESIGN)	LEVEL OF EVIDENCE	DESCRIPTION OF SAMPLE	OUTCOME MEASURES	RESULTS / KEY FINDINGS
Examining the prior authorization process, patient outcomes, and the impact of a pharmacy intervention: A single-center review (2019)	Propatia, Flood, Golbari, Patel, Olbricht, Kimball, Porter	Examine the effect of a centralized pharmacy intervention on the prior authorization (PA) process and the impact of PAs on patient outcomes in a dermatology practice.	Non-experimental (quantitative) time dimensional descriptive retrospective cohort	Research-Level III. High quality	Retrospective review of all prescriptions requiring prior authorizations in a single academic institution	Number of days from prior authorization submittal to approval decision. Number of prior authorization denials. Qualitative review of disease improvement post medication authorization.	Patients with approved PAs had higher likelihood of disease improvement versus those with denied PAs Relevant, current, reliable primary source and specific to chronic disease problem statement. A centralized pharmacy intervention is a cost-effective measure resulting in fewer delays and improved PA decision outcomes but does not eliminate the overall burden of PAs
Intervention Articles							
Medication prior authorization from the providers perspective: A prospective observational study (2016)	Bhattacharjee, Murcko, Fair, Warholak	Objectives of this study were to identify, analyze, and categorize the issues associated with the medication PA process from provider practice perspective	Non-experimental (qualitative) ethnography	Research-Level III. Good quality	29 prescribers, 8 practices from April 13, 2015-April 24, 2015	Direct observation survey tool captured PA processing times at every step of process	PA process for medication used by community providers is in urgent need of modernization. Pain points identified in this study could be alleviated by implementing medication electronic PA (ePA solutions. Relevant, current, small data sample period, includes chronic disease patients
Evaluation frameworks for nursing informatics (2005)	Currie	Study examines strengths and weaknesses of published	Literature review	Non Research Level V, High quality	14 qualitative evaluation frameworks reviewed and categorized into 3	Only 7 evaluation frameworks met all 5 criteria. Of the seven that met all 5 criteria each have	Provided a critique of a comprehensive list of evaluation frameworks specific to healthcare informatics project.

TITLE OF ARTICLE	AUTHORS	RESEARCH QUESTION OR AIM OF THE ARTICLE	TYPE OF STUDY (DESIGN)	LEVEL OF EVIDENCE	DESCRIPTION OF SAMPLE	OUTCOME MEASURES	RESULTS / KEY FINDINGS
		informatics frameworks			groups. Each framework was critiqued based on the following criteria: context centric, user centric, functionality centric, recognizes system development process and if theory based	strengths and weaknesses based on the project type and environment	Article was relevant and specific to the intervention of healthcare project evaluations, is specific to the intended users in healthcare but not specific to electronic medication PA.
The Triangle Model for evaluating the effect of health information technology on healthcare quality and safety (2011))	Ancker, Kern, Abramson, Kaudral.	Illustrates the Triangle model for evaluating health information technology, accommodating both qualitative and quantitative evaluation approaches with an electronic prescribing project	Case Report	Non Research Level V, High quality	Used the Triangle Model to evaluate quality and safety on the implementation of an electronic prescribing software.	The authors posit that the triangle model is most appropriate for summative evaluations of relatively mature health IT systems with good adoption rates. The Triangle model is not intended to be a model of diffusion or adoption.	Proposes a model for health information technology evaluation which is theoretically grounded in Donabedian's Theory. Article is relevant and specific to the proposed intervention of healthcare project evaluation, but not specific to electronic medication PA.
Evaluating informatics applications—clinical decision support systems (CDSS) literature review (2001)	Kaplan	Literature review focused on the evaluation of clinical decision support systems effect on patient care	Literature review	Non Research Level V, High quality	The authors reviewed 27 studies reported in 35 papers on evaluation methods and study desicn of CDSS	The quantitative randomized controlled trial (RCT) was the most frequently used evaluation approach but qualitative approaches are increasing in use more recently	RCT studies are excellent in demonstrating whether an intervention has a pre-specified effect but these study designs tell us little regarding user adoption and usability. The authors suggest a "plurality" of methods be used in evaluating informatics applications. Article is relevant to the

TITLE OF ARTICLE	AUTHORS	RESEARCH QUESTION OR AIM OF THE ARTICLE	TYPE OF STUDY (DESIGN)	LEVEL OF EVIDENCE	DESCRIPTION OF SAMPLE	OUTCOME MEASURES	RESULTS / KEY FINDINGS
							evaluation, intervention proposed and is specific to healthcare informatics but is not specific to electronic medication PA. Article is outdated.
A multi-level usability evaluation of mobile health applications: a case study (2018)	Cho, Yen, Dowding, Merrill, Schnall	Aim is to report a 3 -tier methodological approach for mobile health application usability evaluation	Case report	Non Research Level V, Good quality	Authors present a 3 level method of healthcare informatics application evaluation. 1.User-task 2. User-task-system 3. User-task-system-environment. Interventions were mixed methods of quantitative RCT's and qualitative interviews.	Participants in both the intervention and control rated usability of the application as high. 15 themes were identified from the qualitative interviews. Of these 15 themes, the authors found that the users felt the app is useful, the app is easy to use, and that the app would be useful communication tool between the patient and care team.	Author presents a comprehensive evaluation tool that is specific to health informatics mobile applications. The evaluation tool incorporates end user usability testing, heuristic evaluation, a survey and ethnography. Though not specific to electronic medication PA applications, this could translate well for the evaluation intervention. The article is recent.
Prior Authorization and Utilization Management Concepts in Managed Care Pharmacy (2019)	2018-2019 Academy of Managed Care Pharmacy Professional Practice Committee (AMCP)	Provide a consensus statement for the effective prior authorization practices by managed care organizations.	Consensus statement from nationally recognized organization	Non research - Level IV. Good quality	Not applicable	Not applicable	The AMCP recommends the following concepts to ensure that patients receive appropriate and timely access to drugs, devices, and other therapeutic agents: (1) patient safety and appropriate medication use, (2) clinical decision making, (3) evidence-based review criteria, (4)

TITLE OF ARTICLE	AUTHORS	RESEARCH QUESTION OR AIM OF THE ARTICLE	TYPE OF STUDY (DESIGN)	LEVEL OF EVIDENCE	DESCRIPTION OF SAMPLE	OUTCOME MEASURES	RESULTS / KEY FINDINGS
							automated decision support, (5) transparency and advanced notice, (6) emergency access, (7) provider collaboration, (8) need for timeliness and avoiding disruptions in therapy, and (9) cost-effectiveness and value.
Some Medicare Part D beneficiaries face avoidable extra steps that can delay or prevent access to prescribed drugs. (2018)	Office of Inspector General (OIG). U.S. Department of Health and Human Services	Provide a consensus statement on behalf of the OIG offering opportunities to improve the prior authorization programs and processes.	Consensus statement from government organization expert panel	Non research - Level IV. High quality	Analyzed 2017 annual performance data for 499 Medicare Part D contracts	Examined pharmacy rejections, denials, appeals, and overturned denials for medications requiring prior authorization from Medicare Part D participants	Key findings: 1. Sponsors rejected millions of prescriptions that beneficiaries tried to fill at pharmacies, potentially creating extra steps for beneficiaries that could have been avoided. 2. Sponsors sometimes inappropriately rejected prescriptions that beneficiaries tried to fill at pharmacies 3. Sponsors overturned 73 percent of drug coverage denials that were appealed, indicating that some denials could have been avoided Key intervention recommendations: 1. Take additional steps to improve electronic communication to reduce coverage denials and pharmacy rejections. 2. Take action to reduce inappropriate pharmacy rejections and denials 3. Provide beneficiaries

TITLE OF ARTICLE	AUTHORS	RESEARCH QUESTION OR AIM OF THE ARTICLE	TYPE OF STUDY (DESIGN)	LEVEL OF EVIDENCE	DESCRIPTION OF SAMPLE	OUTCOME MEASURES	RESULTS / KEY FINDINGS
							with clear, easily accessible information. Relevant, current, reliable primary source
Consensus statement on improving the prior authorization process (2019)	American Medical Association (AMA)	Provide a consensus statement on behalf of the AMA offering opportunities to improve the prior authorization programs and processes.	Consensus statement from nationally recognized organization	Non research - Level IV. High quality	2018 AMA Physician survey: 29 question, web survey December 2018. Sample of 1000 practicing physicians, with 40% primary care/60% specialists, currently practicing more than 20+ hours per week and complete PAs during a typical week of practice.	Average wait time for PA responses, Care delays associated with PA, abandoned treatment associated with PA, impact of PA on clinical outcomes, physician perspective on PA burden, Change in PA burden over last 5 years	Consensus statement provides recommendations for interventions: 1. Selective application of prior authorization 2. Prior Auth program review and volume adjustment 3. Transparency and better communication regarding prior auth. 4. Support continuity of care. 5.Automation to improve transparency and efficiency. Relevant, current, reliable primary source but not specific enough to diabetes problem statement.

Appendix B

Theoretical Models

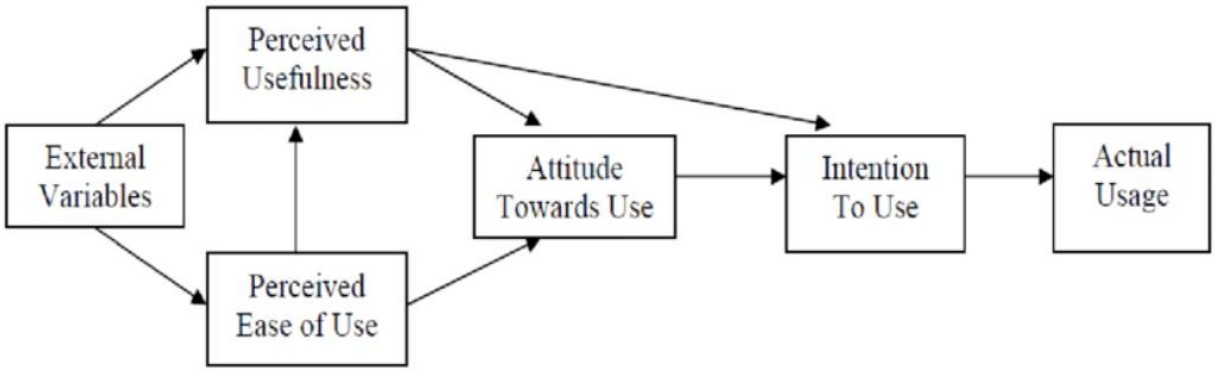


Figure 1: Technology Acceptance Model diagram from Venkatesh, 2000.

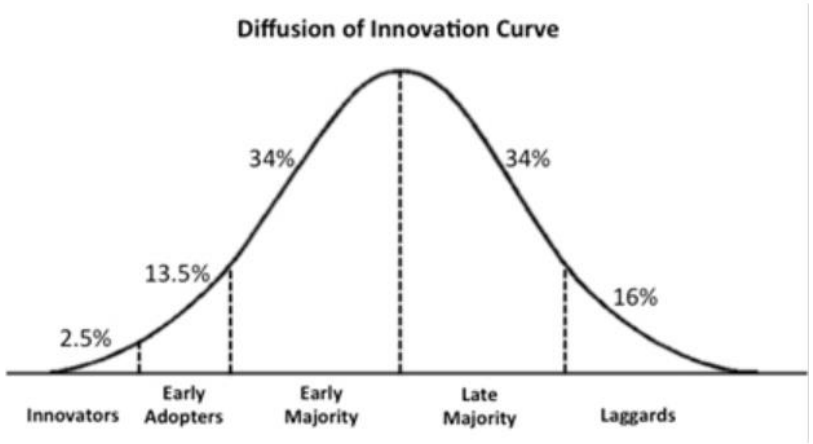


Figure 2: Diffusion of Innovation diagram from Rogers, 2003.

Appendix C

Kellogg Logic Model

RESOURCES/INPUTS	ACTIVITIES	OUTPUTS		OUTCOMES		
		Initial	**Targeted Group**	**Short Term Outcomes**	**Intermediate Outcomes**	**Long Term Outcomes**
Ambulatory operations and nursing leadership, pharmacy, Information Management (IM) and technology (IT) leaders, data analytics, and clinical informatics leaders. Financial budget for resource hours	Develop a post IT project summative evaluation (clinical, operations, financial) of the electronic prior authorization (ePA) system Develop interdisciplinary project steering team Communicate results from initial summative evaluation including user survey.	Initial summative evaluation of the electronic ePA application program interface (API) Build organization structure to support project team.	Ambulatory operations and nursing leadership, IT and IM leadership, pharmacy.	Initial evidence based post IT project summative evaluation reported to stakeholders by June 7th, 2021	Post IT project summative evaluation reported to stakeholders 1-year post optimization by June 2022.	Evidence based informatics project evaluation completed pre- and post-every electronic health records (EHR) project.
Ambulatory nurses, pharmacists, ordering providers (physicians and advanced practice professionals), ambulatory leadership.	Select a validated informatics user adoption and satisfaction survey.	Validated informatics user adoption and satisfaction survey.	Ambulatory nurses and providers.	Initial evidence based validated user survey administered to 75% of identified user community by June 7th, 2021.	Subsequent (1 year post) evidence based validated user survey administered to 75% of identified user community by June 2022.	Evidence based validated user surveys completed pre- and post-every EHR project.
Ambulatory Operations and nursing leadership, IM and IT leaders, pharmacy, data analytics, clinical informatics, clinical and organizational development (COD) and electronic health record (EHR) training.	Design and implement an optimization plan based off summative evaluation. Confirm and schedule IT/IM, clinical educators, EHR trainers and cinical informatics resource for optimization changes.	Optimization plan to include operations, EHR changes, and EHR informatics workflow changes. Confirmed schedule of all resources for optimization Approved budget for optimization.	Patients and families, Ambulatory nurses and providers. Ambulatory operations and nursing leadership.	58% (5% higher than industry benchmark) of mediations requiring PA are approved by August 31st, 2021. (CO)	3% improvement year-to-year in first submission PA approval for 2 years post optimization (CO) 3% improvement year-to-year of medications requiring prior authorization	Improved disease status and chronic disease control; i.e., glycemic control in diabetes patients, decreased seizures for

RESOURCES/INPUTS	ACTIVITIES	OUTPUTS		OUTCOMES		
		Initial	Targeted Group	Short Term Outcomes	Intermediate Outcomes	Long Term Outcomes
Financial budget for resource hours and education.	Obtain approval for optimization budget. Communication of optimization changes.	Communication plan of optimization changes.			approval within 48 hurs of order submission for 2 years post optimization. (CO) 2% reduction year-to-year in medication order to medication PA approval time for 2 years post optimization. (CO).	epileptic patients.
Ambulatory nursing leadership, EHR training, and COD educators. Financial budget for resource hours and education.	Develop optimization education and training	Optimization education and training plan. Attendance sheet.	Ambulatory nurses and providers.	75% of users complete optimization education. (PO)	Electronic medication prior authorization education included in Electronic Health Record new hire orientation training by year 2 post optimization (PO)	New users continue to adopt the electronic medication PA system at a rate higher than 80%.
Ambulatory operations and nursing leaders, IM and IT leaders, pharmacy. Financial Budget for resource hours and chart audits.	Complete validated user adoption and satisfaction survey.	Survey released to staff to complete. Chart audits of ePA system usage.	Ambulatory nurses and providers.	Electronic medication PA system user adoption rate greater than 75% post optimization (PO). Greater than 50% response rate to an electroni medication PA post implementation evaluation user survey post optimization (PO)	Electronic medication PA system user adoption rate greater than 80% 2 years post optimization (PO). Electronic medication PA system user satisfaction rate greater than 75% - 2 years post optimization (PO) Greater than 75% response rate to an electronic medication PA post implementation evaluation user	

RESOURCES/INPUTS	ACTIVITIES	OUTPUTS		OUTCOMES		
		Initial	**Targeted Group**	**Short Term Outcomes**	**Intermediate Outcomes**	**Long Term Outcomes**
					survey 2 years post optimization (PO).	

Appendix D

Gannt Timeline

Project: Reducing Delays for Medications Requiring Prior Authorization: A Post Health IT Project Summative Evaluation and Optimization														
	Timeframe													
Activity	Oct 20’	Nov 20’	Dec-20’	Jan 21’	Feb 21’	Mar 21’	Apr 21’	May 21’	Jun 21’	July 21’	Aug 21’	Sept 21’	Date
PLANNING													
Research and develop informatics post implementation summative evaluation tool													
Identify sources for key performance data for summative evaluation													
Determine key performance measures-clinical, operational, financial and user (adoption and satisfaction)													
Research and select a validated informatics implementation survey tool													
Perform summative evaluation of electronic PA system of existing data													
Communicate initial evaluation results to leadership and staff													
Develop optimization plan based off summative evaluation													
Develop resource and financial plan													
Develop communication plan													
Memorandum of understanding signed by organization													
IMPLEMENTATION													
Schedule resources and budget spending													
Implement communication plan													
Implement optimization based off initial summative evaluation													
Perform post optimization summative evaluation													
DATA COLLECTION													
Collect existing electronic PA data for initial project evaluation													
Collect key performance data for project evaluation post optimization													
DATA ANALYSIS													
Initial informatics post implementation summative evaluation prior to optimization													
Post optimization summative evaluation data analysis													
DISSEMINATION													

Project: Reducing Delays for Medications Requiring Prior Authorization: A Post Health IT Project Summative Evaluation and Optimization													
	Timeframe												
Activity	Oct 20’	Nov 20’	Dec-20’	Jan 21’	Feb 21’	Mar 21’	Apr 21’	May 21’	Jun 21’	July 21’	Aug 21’	Sept 21’	Date
Communicate final report to executives and stakeholders													**Fall 21’**
Decide whether to pursue article publishing													**Fall 21’**
Final Report - May 2022													**May 22’**

Appendix E

SWOT Analysis Table

Strengths	**Weaknesses**
1. Well established multidisciplinary diabetes clinic, workflows and leadership 2. Oversight and supervision of nursing and ancillary diabetes clinic staff 3. Access to data from our EHR, specifically prescription ordering timestamps 4. Ability to lead projects and changes in the endocrine division and outpatient clinics. 5. Chronic diseases such as diabetes targeted in recent community health needs assessment	1. Existing data had to be manually captured. Not a lot of new data. 2. Do not have access to data at receiving pharmacies 3. Diabetes team involved in many other heavily resourced projects 4. New endocrine division leadership currently transitioning
Opportunities	**Threats**
1. New incoming division leadership looking to increase research and evidence-based practice changes. 2. Community health team investment is working on food/nutrition and activity to address type 2 diabetes in 2 specific neighborhoods in Chicago. 3. Organization approved centralized med prior auth team and electronic med prior authorization system.	1. Project timeline for implementation of electronic med prior authorization system misaligned with scholarly project timeline 2. Other diabetes projects may be prioritized higher for resources and support. 3. Resources for health IT project evaluation and optimization are not guaranteed or may not be available at the right time.

Appendix F

Memorandum of Understanding

Memorandum of Understanding

Memorandum of Understanding

Between

Arnold Butiu, Doctor of Nursing Practice (DNP) student

Boise State University

and

[redacted]

This Memorandum of Understanding (MOU) outlines the terms and understanding between the *Arnold Butiu*, a DNP student at Boise State University, and [redacted] to implement a quality improvement project aimed at reducing medication prior authorization times by optimizing the electronic medication prior authorization (PA) system and measuring nurses user satisfaction and user adoption.

Background

Health care insurance companies require PAs for many medications to keep costs low by reducing duplication, ensuring the medication is medically necessary, and encouraging less expensive alternative medications be used. Medications requiring PA have increased from 8% to approximately 24% of covered drugs on Medicare Part D plans between 2007 and 2019 (Resnick, 2020). In four therapeutic classes, the number of steps to obtain medication PA increased from 35% in 2011 to 67% in 2016 (Resnick, 2020). Patients with chronic diseases such as diabetes, asthma, ADHD and seizures require daily medications to manage their disease and prevent clinical crisis such as diabetic ketoacidosis, asthma attacks, and seizures. Requiring medication PA introduces an immediate delay for patients obtaining their medications. These delays result in worsening disease status and inadequate disease management (Bergeson et al., 2013; Dunn et al., 2017).

In 2015 [redacted] ambulatory leaders completed a performance improvement assessment where nursing staff manually tracked the amount of time it took for prescriptions requiring PA in seven ambulatory specialties. The data collected revealed that it took an average of over 90 hours for medications requiring PA to be approved when measured from EHR order to PA approval time ([redacted]. The project also found that full-time nurses were spending an average of 5 hours per week processing medication PAs, which included; phone

calls, faxes and emails, and pharmacy insurance portals ([redacted]). This time spent was considered administrative work and was a major dissatisfier with the ambulatory nurses in [redacted] employee engagement survey, with some nurses specifically calling out their dissatisfaction with the PA process in the comments.

To address these delays due to medication prior authorization, [redacted] approved two projects in 2019– a centralized prior authorization team and an electronic medication prior authorization (ePA) application program interface (API). In August 2020, [redacted] successfully implemented the ePA system that integrates with the electronic health record system—Epic.

Purpose

The purpose of this scholarly project is to reduce medication prior authorization times by evaluating and optimizing the recently implemented ePA system. Nursing user satisfaction will be measured pre and post optimization and evaluated for impact on user adoption and ePA system utilization.

Intended Project Outcomes

Pediatric patients with chronic disease with prescriptions that require prior authorization should experience

- Reduced medication prior authorization times from order to prior authorization approval

Ambulatory nursing staff from chronic disease divisions will demonstrate

- Increased user satisfaction with the ePA system
- Increased user adoption of the ePA system

Duration

The scholarly project timeline will consist of a twenty-month period from September 2019 though April 2022. There will be six phases which will include assessment, planning, implementation, data collection, data analysis and dissemination. During the assessment phase, the problem was identified at the local, state and national level. During the planning phase, the project steering team and stakeholders were identified and organized to include ambulatory nursing leadership, nursing informatics, educators, information technology and management leaders. A literature search was conducted for possible interventions to address the problem of delays in receiving medications due to prior authorization. The implementation phase, which will take place during the summer of 2021, will be the intervention of the user satisfaction survey and ePA system optimization. Quantitative data will be collected pre and post the intervention and analyzed for impact on the desired outcomes. The final phase will be the dissemination of the results to project steering team, stakeholders and senior hospital leadership.

Reporting

The DNP student will provide bi-monthly and milestone updates to the project steering team and stakeholders starting January 2021. There will also be a report out to senior hospital leadership in May 2021 just prior to the optimization intervention and findings upon completion of the project in October 2021. The DNP Scholarly Project will include a final report, an abstract, and an oral presentation of the report and potential publication. The DNP student will submit a Final Project Report for publication in ScholarWorks. ScholarWorks is a collection of services designed to

capture and showcase all scholarly output by the Boise State University community, including doctoral dissertations and doctoral project reports.

No personal identifiers will be included, and all data will be reported in aggregate form. The author welcomes any comments or suggestions from [redacted] but reserves the right to publish findings and analysis according to professional standards and principles of academic freedom. For any work of a scholarly nature, the author agrees to follow the organization(s) preferences in how it is to be named (or not) in the work.

Complete this section by adding the information below, after conversation with the organizational liaison/representative:
Agency preferences for how they are named/referred to within the student's work: by organizational name or solely by general type of agency within a region?

In the student's Final Report?	No restrictions, as deemed appropriate by student
In an abstract?	No restrictions, as deemed appropriate by student
In professional presentations?	No restrictions, as deemed appropriate by student
In professional publications?	No restrictions, as deemed appropriate by student
Any restrictions in the discussion of project details?	No restrictions

Student Contact Information
Arnold Butiu
[redacted]

_____Date: 12/22/2020
(*DNP Student signature*)
Arnold Butiu, Boise State University DNP student

_____Date: 12.22.2020
(*Organizational Contact signature*)
[redacted]

Appendix G

User Involvement Survey

(Adapted from the Doll and Torkzadeh Survey, permission not required)

Question	Dimension	Scale
Does the system provide the information you need	Content	5-Point Likert Scale
Are you satisfied with the accuracy of the system	Accuracy	5-Point Likert Scale
Do you consider the system to be reliable	Accuracy	5-Point Likert Scale
Is the information clear	Format	5-Point Likert Scale
Are you satisfied with the layout of the output	Format	5-Point Likert Scale
Does the system provide up-to-date information	Timeliness	5-Point Likert Scale
Does the system provide updated info often enough	Timeliness	5-Point Likert Scale
Is the data in the system updated fast enough	Timeliness	5-Point Likert Scale
Is the system user friendly	Ease-of Use	5-Point Likert Scale
Is the system easy to use	Ease-of Use	5-Point Likert Scale
Is the system efficient	Ease-of Use	5-Point Likert Scale
Would you recommend the ePA system	Satisfaction	5-Point Likert Scale
Comments:	Open ended question	Free text

User Data Points:

- How often do you use the ePA system per week? (Number entry)
- How many years of experience as a registered nurse? (Number entry)
- How many years of experience do you have completing medication prior authorizations?
- What is your ambulatory specialty? (Drop down list)

Appendix H

Pre- and Post-Optimization Survey Results: Free Text Comments Groupings

Subject	Survey Comment	Grouping
PRE-OPTIMIZATION SURVEY RESULTS—FREE TEXT COMMENTS GROUPINGS		
Ease of Use	When clinic notes are requested. It is difficult to upload. We have to print this out and upload. Extremely time consuming. The EPIC needs an automatic attachment to upload clinic notes.	Negative
Ease of Use	The prior authorization questions we get for ePAs are often not as specific as we get on cover my meds. I find cover my meds website easier to use and easier to follow up on pending PA's. The layout and tabs could be easier to use in the EPIC. However, it is nice to have the approval automatically saved when done thru Epic	Neutral
Ease of Use	I would like to be able to do all PA's this way	Positive
Ease of Use	Epic/CMM is a beneficial tool for completing PA request. It is able to identify the patient's pharmacy benefit manager and demographics which saves me time. Unfortunately as a member of the centralized prior authorization team, I do not use this interface to complete request. The request are attached to the provider's fax number and many times determinations are faxed instead of uploading to Epic. It takes time to track down determination letters. Instead I will use the request key already created and complete on CMM's website as the demographics are already included. In CMM website I am able to change the fax number where I would like determination letter faxed.	Negative
Ease of Use	I do use cover my meds, but my concern with it when it declines it, I have to contact the insurance to find out why, so that's an extra step. Last week I had a PA that required my talking to insurance and issue is they wouldn't accept sweetener being used, and I couldn't find that out till I called insurance. Cover my meds did not know. I actually prefer Meridian online as that's the easiest, and I also have forms for numerous companies - CVS caremark, Optum Rx, Prime Therapeutics to use. Illinois Medicaid is quick by phone when I'm in a rush to get a med approved. Things that are frustrating w/ cover my meds are when I don't have write insurance ID, don't have right dx code, and they cannot help me where an insurance company can	Negative

Subject	Survey Comment	Grouping
Ease of Use	This system is very difficult to follow.. there is no step to step process.. poor feedback on what item is missing and often MCO groups prefer their firm, so this EPA is useless and often is double work. Not efficient at all.	Negative
Ease of Use	Using this system is as clear as mud!	Negative
Accuracy	In theory, the system should be easier to use than going to the CMM website. However, it is not. The pharmacy benefits are typically either wrong or not available.	Negative
Accuracy	Many authorizations are submitted and not needed, cannot locate patient	Negative
Accuracy	Specifically in neuromuscular, our medications are so specialty that it does sometimes trigger the EPA but we have to do the medication through already established PA processes. It’s just another thing that is in the way for these medications.	Negative
Accuracy	I often find that ePA requests authorizations that are already in place and not needed. It's difficult to check the status on a submitted ePA. I prefer cover my meds or a paper form I can fax in.	Negative
Accuracy	PA initiated with several PA not actually needed, perhaps an system improvement for providers is needed to PA's are not initiated when not needed, also when PA's are initiated in through Epic they will not always come through under Epic in basket and results in RN needing to complete PA under " orders only tab"	Negative
Accuracy	The ePA system is a great idea, but frequently ends up being more time consuming than using CoverMyMeds. Issues include medications being flagged as requiring PAs that do not require PAs, legal names in out system differing than what is on the insurance card, having difficulty and MANY extra steps attaching documents and the supporting chart notes which result in denials and PA resubmissions, PA requests for medications which already have existing PAs on file that are not due to expire.	Negative
Accuracy	the ePA system generates Prior Authorizations that are NOT needed so it can be a huge time waster as it is automatically generated. Also, attaching clinic notes is not clear.	Negative
Timeliness	I will usually call to initiate a PA and then complete the form that is sent to me, usually I will get an answer while I am on the phone.	Negative

Subject	Survey Comment	Grouping
Timeliness	The integrated system does not provide updated info on a regular basis, and you are stuck waiting for it to respond. the integrated system also expects, or needs a PA for generic meds that DO NOT require a PA, and sometimes you have difficulty releasing the medication and moving on. That is a waste of people's time	Negative
Timeliness	I do not use it very frequently therefore I probably am not efficient at it. My biggest complaint is that may give the determination faster but then you still have to wait for the denial letter to be faxed before you can continue. That is very frustrating	Negative
Format	There should be an option to renew PA, it goes away after 3/4 days and the only option is to start a PA the previous way via cover my meds online or by fax	Negative
Format	The system is not user friendly and there is always just a large list of patients (have to open each individually to see which provider follows each patient). Also, medications that are covered get stuck in that Epic tab and families complain that we did not send the prescription.	Negative
POST-OPTIMIZATION SURVEY RESULTS—FREE TEXT COMMENTS GROUPINGS		
Subject	**Survey Comment**	**Grouping**
Ease of Use	We already use covermymeds (portal), which is a much easier, user friendly EPA. The EPA does not automatically update for all meds, nor does it provide authorization information to the department to provide to the pharmacy/HUB. Meds are held up unless manually released. Prefer to continue with on-line submission as this is efficient and easy.	Negative
Ease of Use	1) When it's denied there's a delay in getting documentation from the insurance carrier 2) when denied it doesn't tell you why.	Negative
Ease of Use	I do not use this feature in NICU Follow Up Clinic	Neutral
Ease of Use	I prefer to use cover my meds—with ePA I have no way of tracking the status or checking to see if a PA has a response. It still prompts for PA on medications that should not need one (eg, levothyroxine)	Negative
Accuracy	The system is always calling for a PA for Symbicort and for Medicaid, brand is covered without issue. It is also very challenging to know which patients belong to which provider. I think some reeducation about the system may be helpful once the updates are complete.	Negative

Subject	Survey Comment	Grouping
Accuracy	Often insurances and patients do not match, PA not needed, multiple attempts needed at EPA to complete.	Negative
Format	Since the upgrade I now do NOT have a PA detail button to attach a PDF. Therefore I have to submit a PA on the external CMM Portal.	Negative
Timeliness	Unfortunately, others in my office can't tell when I have started a PA, it also can't be checked on once it is started, it will just continue to say "waiting for payer response", you can't renew if it is delayed. It is not a helpful app within epic.	Negative

Appendix I - Outcome Evaluation Table

Outcome	Data Collection Instrument /Data	Analysis Goal	Analytic Technique
Initial evidence-based post IT project summative evaluation reported to stakeholders by June 7th, 2021	Summative report consisting of user satisfaction survey results and median medication prior authorization (ePA) times reported to stakeholders prior to optimization implementation	Report baseline information to stakeholders prior to optimization. Identify opportunities to optimize the ePA process.	Met/Unmet
Initial evidence based validated user survey completed by 75% of identified user community by June 7th, 2021.	Instrument: Doll and Torkzadeh validated user informatics satisfaction questionnaire administered by Information Management manager to identify user community. This informatics user satisfaction survey is broken out into 5 dimensions: content, accuracy, format, ease of use, and timeliness. Data: The validated survey is a 12 question Likert 7-Point Scale questionnaire. The scores from this user satisfaction survey may correlate to increased user adoption and reduced medication prior authorization times.	Provide a baseline report of user satisfaction and user adoption prior to optimization	Descriptive Statistics will be used to measure the percentage of users that complete the satisfaction survey.
58% (5% above industry benchmark) of medications requiring PA are approved on first ePA submission by August 31st, 2021. **75% of medications requiring prior authorization are submitted prospectively by August 31st, 2021.** **5% reduction in median ePA turnaround time from baseline data by August 31st, 2021.**	Instrument: Electronic health record (EHR-Epic) and Surescripts (vendor) electronic medication prior authorization (ePA) reports. The Epic ePA reports can be retrieved ad hoc. The Surescripts reports are published monthly. Data: Quantitative data report with the following data measures: time for ePA approval from order to approval, ePA approval rates, % of ePAs that were approved on first submission.	Provide a report of ePA efficiency and effectiveness	Descriptive Statistics will be used to measure the mean, median, and standard deviations of the scores from the ePA data from the EHR and Surescripts.

Outcome	Data Collection Instrument /Data	Analysis Goal	Analytic Technique
75% of visits will have pharmacy insurance benefits verified by August 31st, 2021.			
75% of users complete optimization education by July 1st, 2021.	Instrument: ePA users will be sent a one-page tip sheet regarding the optimization changes with a requested email reply whether education was competed. Data: Microsoft Excel spreadsheet will be used to collect the number of users who completed education divided by total number of users that were sent the education tip sheet.	Ensure a high percentage of users complete the optimization education.	Descriptive Statistics will be used to measure the percentage of users that completed the optimization education.
ePA system user adoption rate greater than 75% post optimization by August 31st, 2021. **ePA system user satisfaction rate greater than 50% post optimization by August 31st, 2021.** **Greater than 50% response rate to an electronic medication PA post optimization user survey by August 31st, 2021.**	Instrument: Adapted Doll and Torkzadeh informatics user satisfaction questionnaire administered by Information Management manager to identified user community. This informatics user satisfaction survey is broken out into 5 dimensions: content, accuracy, format, ease of use, and timeliness and satisfaction. Data: The validated survey is a 12 question Likert 7 Point Scale questionnaire. The scores from this user satisfaction survey may correlate to increased user adoption, increased ePA system utilization and reduced medication prior authorization times.	Provide a report of user satisfaction and user adoption of the ePA system post to optimization.	Descriptive Statistics will be used to measure the mean, median, and standard deviations of the scores from the user informatics satisfaction survey. Will use inferential statistical T Test analysis of the qualitative open-ended comment question.

Appendix J

Budget (2-3 Year)

Arnold Butiu - Scholarly Project 2-3 Year Budget					
Yearly Totals:	**$11,210.00**	**$6,536.70**	**$6,788.80**	***3 year Total Cost of Project***	**$24,535.50**
Expense Category	**Year 1**	**Year 2**	**Year 3**	**Rationale**	
Staffing Salaries	$5,070.00	$309.00	$318.27	1st year salaries include project steering team. 4 hours per year for Project Manager for year 2-3 + 3% increases per year.	
Yearly Survey	$1,200.00	$309.00	$318.27	1st year includes initial survey implementation costs. 4 hours per year Project Manager for year 2-3 + 3% increases per year.	
Labor- IT/IM ePA	$4,000.00	$206.00	$212.18	1st year includes initial survey implementation costs . 4 hours per year IT/IM Analyst labor for year 2-3 + 3% increases per year.	
IT EHR- ePA Interface Fees	$0	$5,600.00	$5,824.00	1st year includes initial survey implementation costs. 4 hours per year Project Manager	
Administrative Supplies	$100.00	$20.00	$20.60	1st year includes project team implementation supplies, following years 2-3 cover incidental supplies for survey with 3% increases per year.	
Labor- Data Analytics Reporting	$340.00	$41.20	$42.44	1st year includes initial report development, years 2-3 cover 1 hour of labor to maintain reports with 3% increases per year.	
Labor- Training and Education	$500.00	$51.50	$53.05	1st year includes education/training of initial optimization, years 2-3 cover 1 hour of labor to maintain education materials with 3% increases per year.	
Operating Expense Subtotal	**$11,210.00**	**$6,536.70**	**$6,788.80**		
In Kind	**$11,110.00**	**$6,516.70**	**$6,768.20**	Majority of expenses is labor provided in-kind	
Total Operating Expense	**$100.00**	**$20.00**	**$20.60**	***3 year total $140.60***	

Appendix K

Expense Report

Arnold Butiu-- Scholarly Project Expense Report							
				In Kind Total	$11,110	Grand Total	$11,210
Source of Expense	**Expense Description**	**Dollar Value**	**Type of Cost (variable/fixed)**	**Description of Cost**	**Estimated Volume**	**Cost per Unit**	**Total**
Staffing- Project Steering Team ***(In Kind)***							$5,070
Project Manager	Salary offset for project team	$75	Variable	Staffing salary per hour	40	$3,000	
Senior Director for Digital Health		$125	Variable		4	$500	
Chief Medical Information Officer		$150	Variable		2	$300	
Nursing Informatics Director		$75	Variable		2	$150	
Informatics Educator		$40	Variable		8	$320	
Nursing Educator		$50	Variable		4	$200	
Software Vendor Support (CoverMyMeds)		$50	Variable		4	$200	
Certified Diabetes Educator Nurse		$50	Variable		8	$400	
User Survey Development and Implementation ***(In Kind)***							$1,200
Development of user satisfaction and user adoption survey in Survey Monkey or Microsoft Forms	Development and implementation of validated user adoption and user satisfaction tool	$75	Variable	Project Manager staffing salary hours to build user surveys	16	$1,200	
Information Management (IM)--Electronic Prior Authorization (ePA) Optimization ***(In Kind)***							$4,000
Pharmacy benefits insurance improvements	Optimization changes in Epic Electronic Health Record (EHR)	$50	Variable	IM Epic Analyst salary hours to optimize ePA	30	$1,500	
Electronic prior authorization Epic EHR improv		$50	Variable		30	$1,500	
Pharmacy prior authorization Epic EHR improvements		$50	Variable		20	$1,000	
Administrative Supplies and Support							$100
Office supplies- printed materials, copying, handouts	Kickoff and project close meetings	$50	Fixed	Office supply costs through hospital vendor	1	$50	
Meeting Refreshments		$50	Fixed	Refreshments to be provided by hospital catering	1	$50	
Data Analytics and Reporting ***(In Kind)***							$340
Epic ePA Report Adjustments	Adjust existing Epic EHR ePA Reports	$40	Variable	Reporting specialist hours to revise existing reports	2	$80	
Chart Audits for ePA user adoption	New chart audit report in Epic	$40	Variable	Reporting specialist hours to create chart audit report	4	$160	
CoverMyMeds Medication Dispense Reports	Adjust existing CoverMyMeds Reports	$50	Variable	Vendor support to revise existing reports	2	$100	
Training and Education ***(in Kind)***							$500
Develop EHR ePA Optimization Training materials	Development and distribution of training materials	$50	Variable	Training Tip Sheets on ePA Optimization	8	$400	
Use of electronic education system (WeLearn)		$100	Fixed	One time cost to possibly use WeLearn to distribute education	1	$100	

Appendix L

Statement of Operations

Statement of Operations

Operating Income (All In Kind) — **Arnold Butiu**

	Revenue Total	**$**	**11,210.00**
Source (ALL IN KIND)	**Description**		**Amount**
Labor-Project Manager and Project Steering Team	Project labor for steering team members and project manager	$	5,070.00
Labor- IT/IM	Project labor from IT/IM team	$	4,000.00
Labor-Data Analytics Reporting	Project labor from data analytics	$	340.00
Labor- Training and Education	Project labor from EHR training team	$	500.00
Labor-Survey Development	Project management labor to develop and implement survey	$	1,200.00
Organization	Administrative supplies and space	$	100.00

	Expenses Total	**$**	**11,210.00**
Expenses	**Description**		**Amount**
Project Steering Team Labor	Project labor for steering team members and project manager	$	5,070.00
Labor- IT/IM ePA	Project labor from IT/IM team	$	4,000.00
Labor- Data Analytics Reporting	Project labor from data analytics	$	340.00
Labor- Training and Education	Project labor from EHR training team	$	500.00
Survey Development	Project management labor to develop and implement survey	$	1,200.00
IT EHR- ePA Interface Fees		$	-
Administrative Supplies	Administrative supplies and space	$	100.00

Appendix M

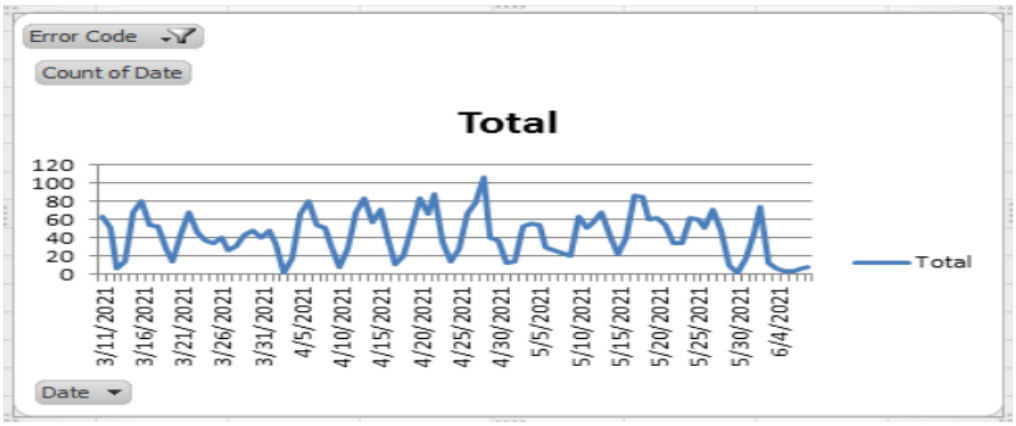
Optimization Intervention: Medications Excluded from ePA

ACETAMINOPHEN 160 MG/5 ML ORAL SUSPENSION [9230]
ALCOHOL SWABS [100655]
CALCIUM CARBONATE 200 MG CALCIUM (500 MG) CHEWABLE TABLET [18196]
CALCIUM CARBONATE 500 MG CALCIUM (1,250 MG) TABLET [1447]
DIPHENHYDRAMINE 12.5 MG/5 ML ORAL ELIXIR [2760]
DIPHENHYDRAMINE 12.5 MG/5 ML ORAL LIQUID [13821]
DIPHENHYDRAMINE 25 MG CAPSULE [2758]
DIPHENHYDRAMINE 25 MG TABLET [2754]
FERROUS SULFATE 325 MG (65 MG IRON) TABLET [3433]
IBUPROFEN 100 MG/5 ML ORAL SUSPENSION [11343]
SODIUM BICARBONATE 650 MG TABLET [21635]
CLINDAMYCIN PHOSPHATE 1 % TOPICAL SWAB [35060]
ATENOLOL 25 MG TABLET [793]
CIMETIDINE 400 MG TABLET [10673]
TRIAMCINOLONE ACETONIDE 0.1 % TOPICAL OINTMENT [9037]
GUANFACINE 1 MG TABLET [11243]
MINOCYCLINE 100 MG CAPSULE [5702]
KETOCONAZOLE 2 % TOPICAL CREAM [11473]
DOXYCYCLINE HYCLATE 100 MG TABLET,DELAYED RELEASE [142580]
CLINDAMYCIN 1 % LOTION [21703]
FLUOCINOLONE 0.01 % TOPICAL SOLUTION [3565]
DIVALPROEX 125 MG CAPSULE,DELAYED RELEASE SPRINKLE [104797]
MUPIROCIN 2 % TOPICAL OINTMENT [18755]
PROPRANOLOL 10 MG TABLET [7421]
PREDNISOLONE SODIUM PHOSPHATE 15 MG/5 ML (3 MG/ML) ORAL SOLUTION [34857]
HYDROXYZINE HCL 10 MG/5 ML ORAL SOLUTION [4248]
ALCLOMETASONE 0.05 % TOPICAL OINTMENT [10010]
SULFASALAZINE 500 MG TABLET [8429]
NAPROXEN SODIUM 550 MG TABLET [94625]
MIDODRINE 2.5 MG TABLET [11725]
FAMOTIDINE 40 MG TABLET [83213]
KETOROLAC 10 MG TABLET [36708]
LEVETIRACETAM 100 MG/ML ORAL SOLUTION [130502]
PROPRANOLOL 40 MG TABLET [91137]
ETODOLAC 300 MG CAPSULE [11088]
AMOXICILLIN 600 MG-POTASSIUM CLAVULANATE 42.9 MG/5 ML ORAL SUSPENSION [33882]
BUMETANIDE 1 MG TABLET [99832]
MULTIVITAMIN AND MINERALS NO.11-FOLIC ACID 5 MG TABLET [193887]

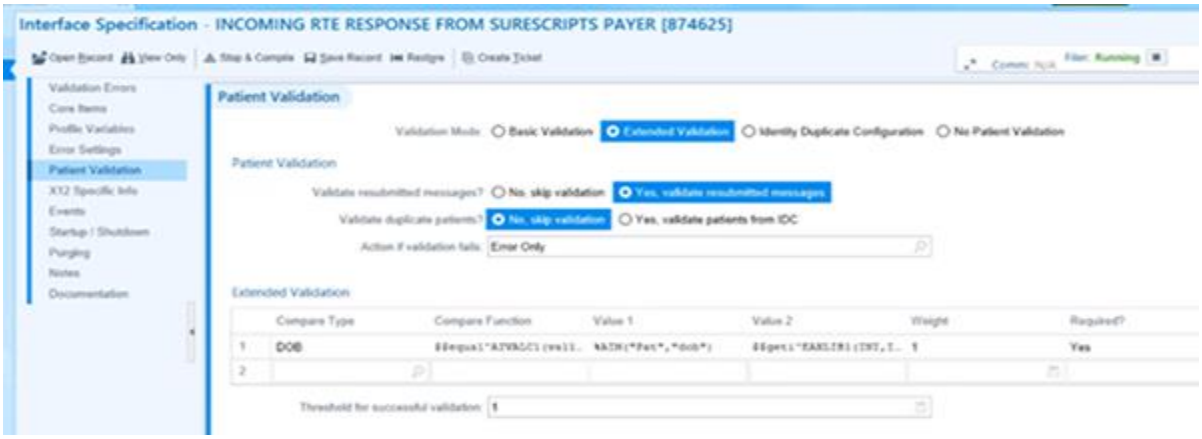
Appendix N

Optimization Intervention: Matching Logic Changes

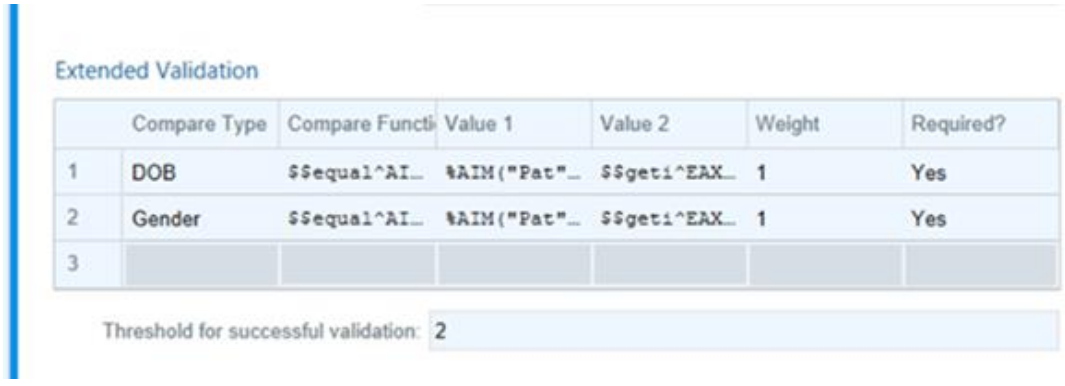
Patient Validation Failures Prior to Intervention 3/11/21-6/4/21



Optimization Change- 6/4/21 Patient Matching Validation with Pharmacy Benefits



Validation Screen Prior to Optimization Intervention



Appendix O

Optimization Intervention: Attaching Documentation to an ePA Communication

Attaching Epic Documentation to an Electronic Prior Authorization

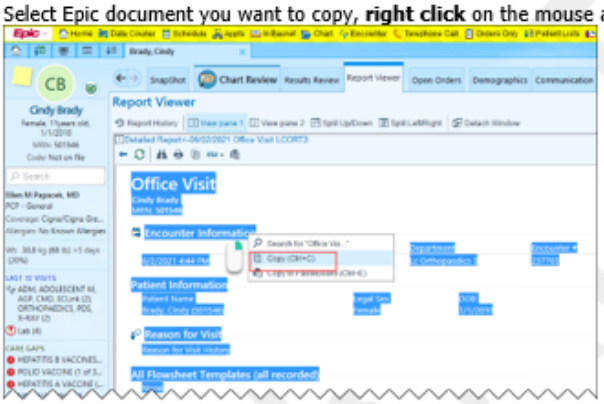
Epic Tip Sheet

This tip sheet provides Best Practice for attaching Epic Documentation to an Electronic Prior Authorization Communication more efficiently.

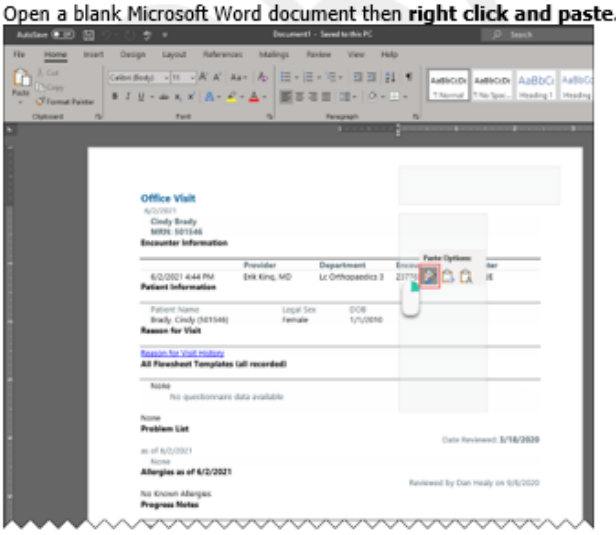
Attaching Epic documentation to an ePA communication

Copying and Saving Documentation as a PDF

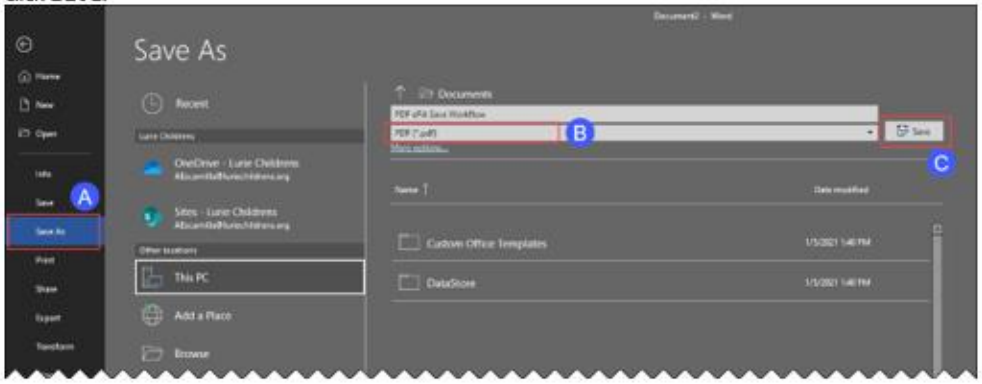
1. Select Epic document you want to copy, **right click** on the mouse and select **Copy All**.



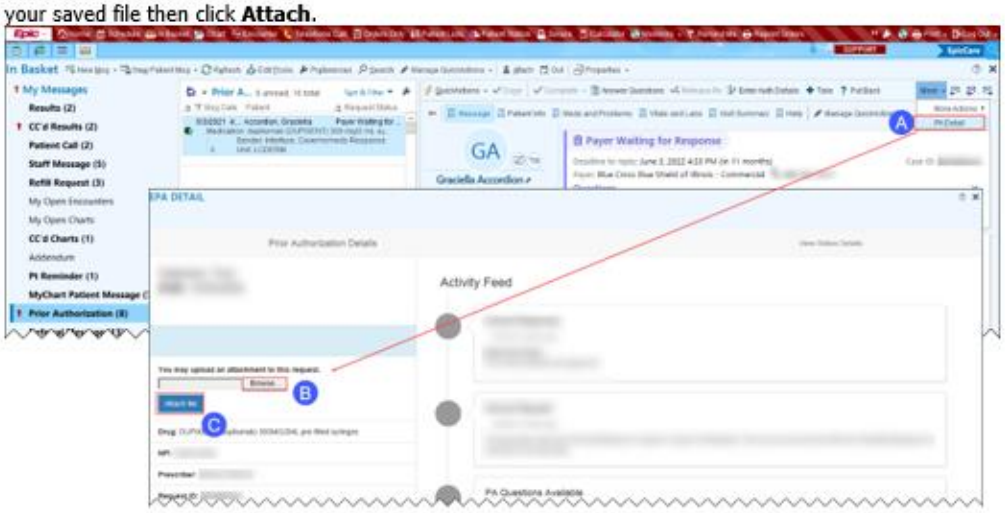
2. Open a blank Microsoft Word document then **right click and paste**.



3. Delete any unwanted pictures or information. Add additional information as needed.
4. Save the documement chosing the option "**Save As**". Name your file and change the file type to "**PDF**" then click **Save**.



5. Click the **PA Details** action button within the Prior Authorization In Basket folder. Click **Browse** to search for your saved file then click **Attach**.



Appendix P

Optimization Survey Demographics

Total of 57 Pre-Optimization responses out of the 194 surveys sent out.

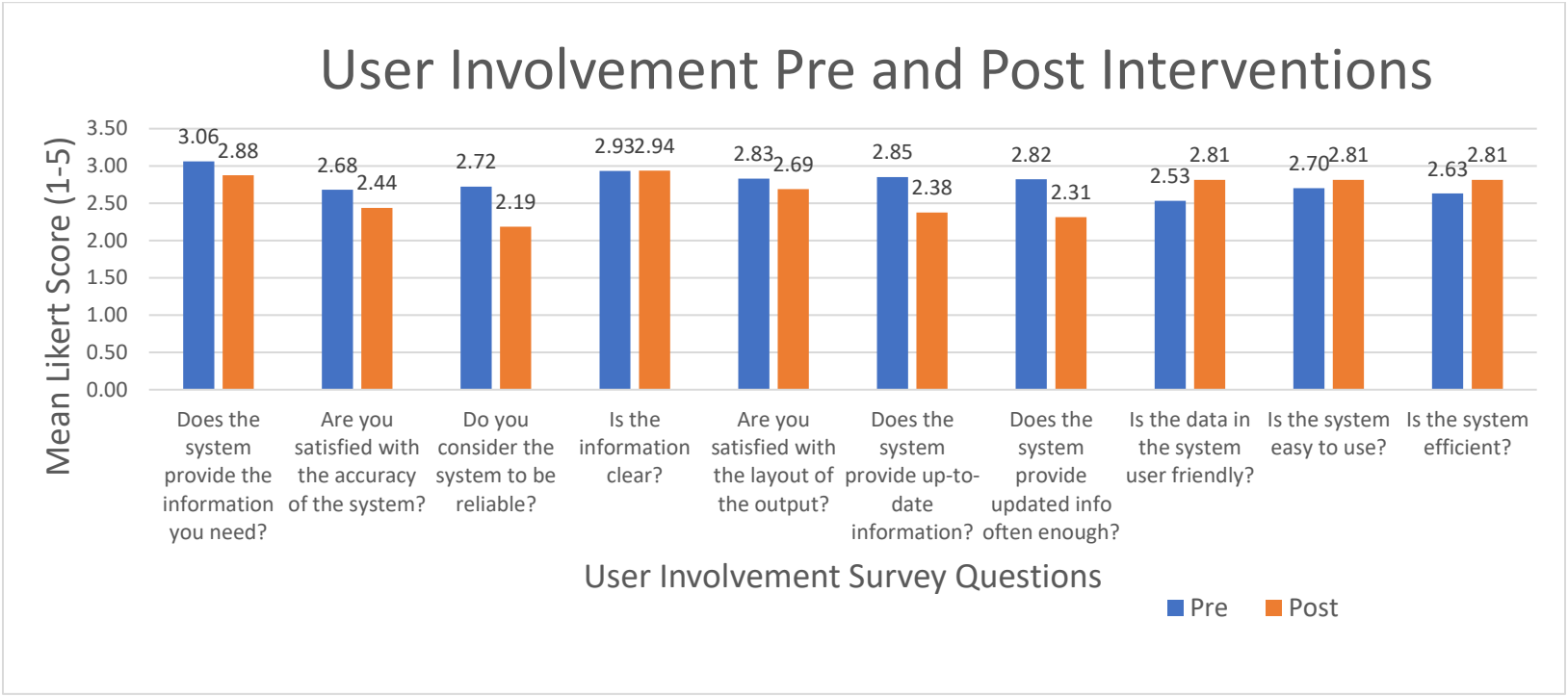
	Years' Experience RN	*Years' Experience-PA*	*Frequency PA / Week*
Mean	16.0	5.7	2.0
Median	10	4	1.5
Mode	5	6	0
Standard Deviation	12.1	5.8	2.0
Sample Variance	145.7	33.5	4.0
Kurtosis	-0.58	2.59	3.15
Skewness	0.80	1.70	1.49
Minimum	2	0	0
Maximum	46	25	10
Sum	912.35	324.4	111
Count	57	57	56

Total of 16 Post Optimization Survey Responses out of 194 Sent Out

	Years' Experience RN	*Years' Experience-PA*	*Frequency PA / Week*
Mean	18.9	6.6	7.5
Median	17.5	5	2.5
Mode	5	5	0
Standard Deviation	12.2	6.5	15.3
Sample Variance	148.7	41.6	233.6
Kurtosis	-1.23	0.56	10.30
Skewness	0.34	1.26	3.12
Minimum	4	0	0
Maximum	40	20	60
Sum	302	106.3	121
Count	16	16	16

Appendix Q

User Involvement Likert Score Summary and Net Promotor Score (NPS)

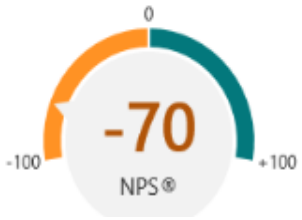


6. How likely would you recommend the ePA system to a friend or colleague?

More Details

Pre-Intervention

Promoters	3
Passives	10
Detractors	41

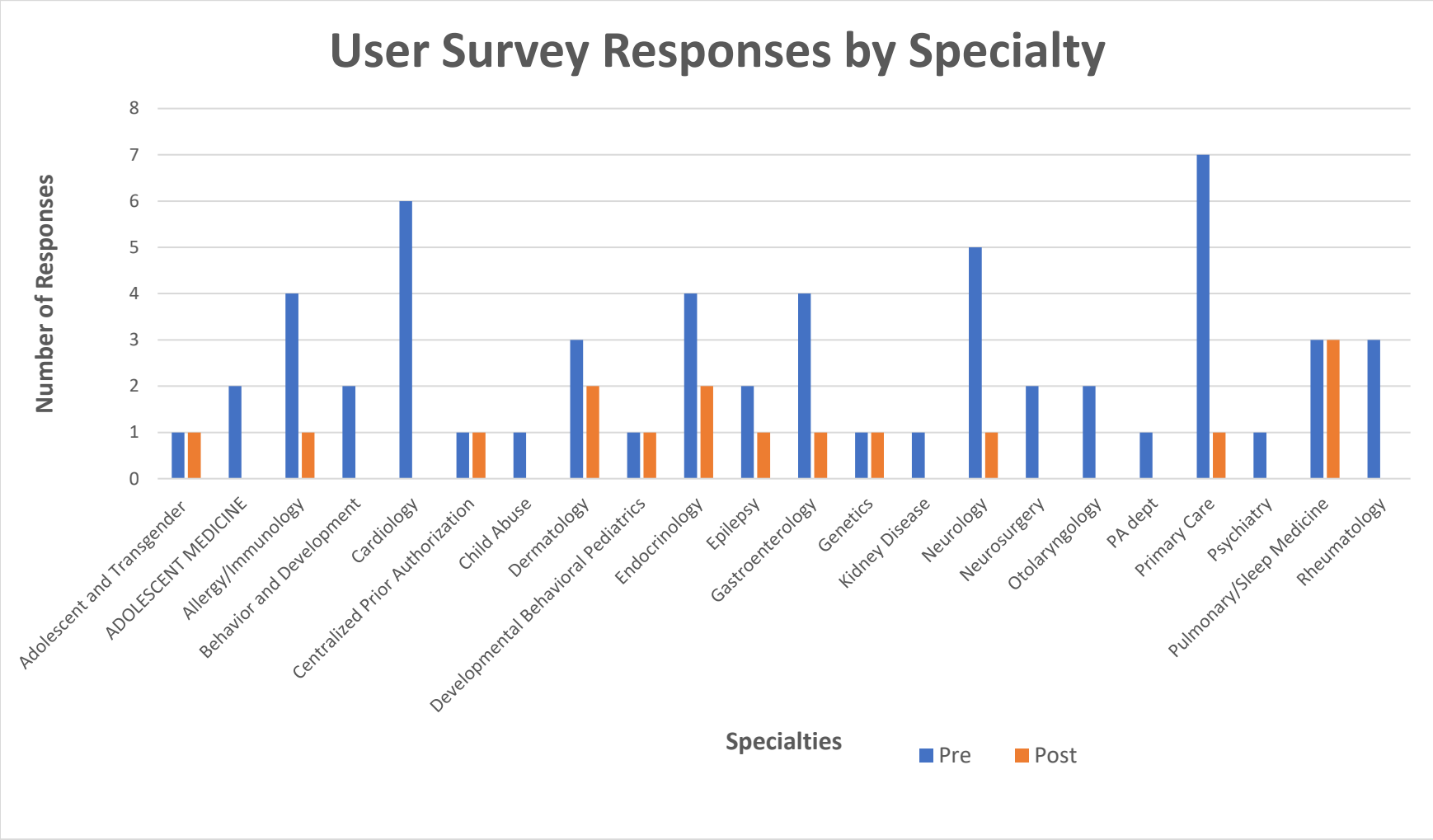


Promoters	1
Passives	1
Detractors	14

Post Intervention

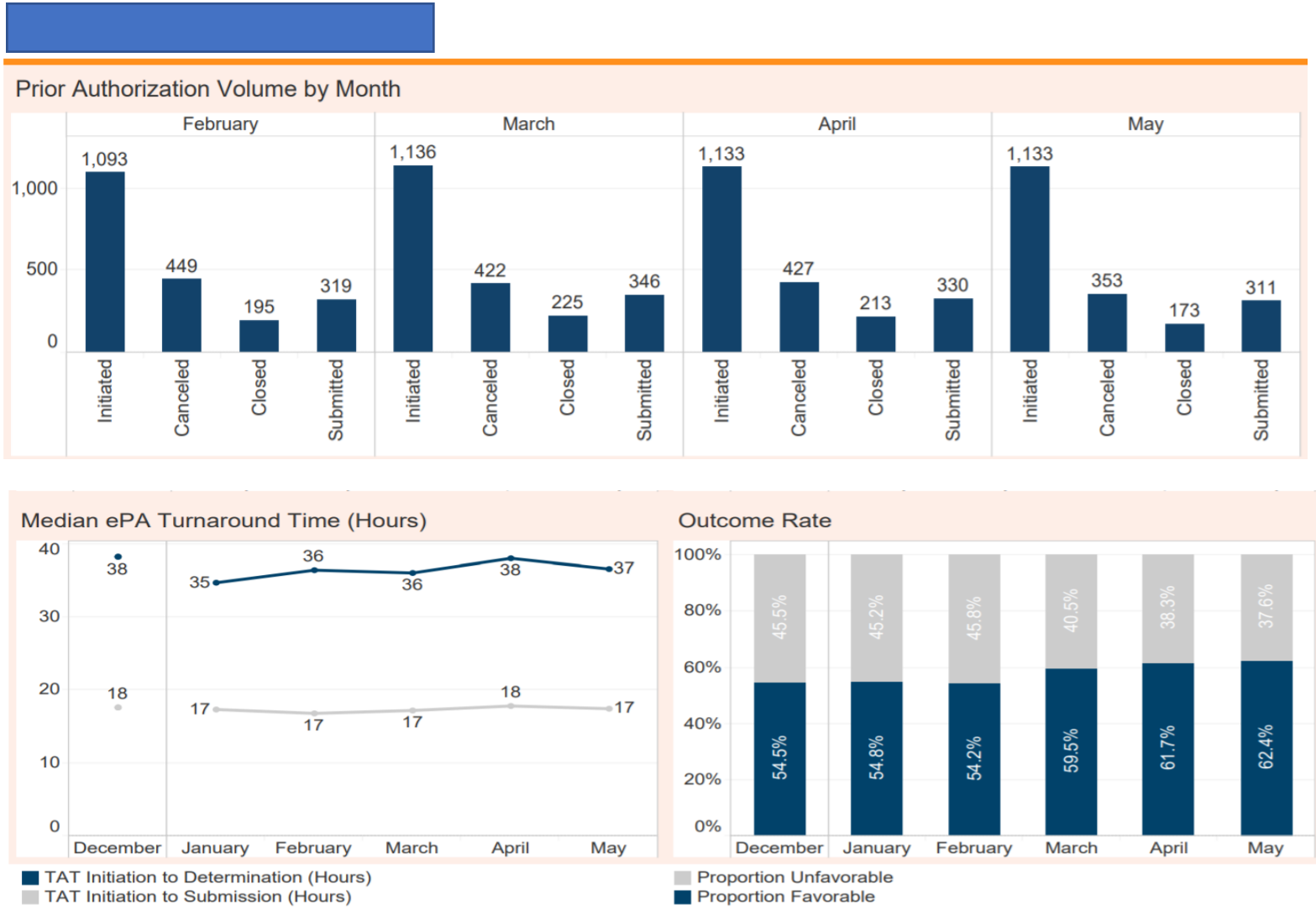
Appendix R

User Involvement Survey Responses by Specialty



Appendix S

ePA Volumes and Turnaround Times Pre Optimization



Appendix T

ePA Volumes and Turnaround Times Post Optimization