Impact of Pharmacist Expertise on Acceptance Rates in a Comprehensive E-Consult Program within a Large Academic Health System

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Abstract
Background: Although electronic consults (e-consults) are utilized in healthcare systems by medical professionals, use of e-consults by pharmacy remains novel outside of niche disease states. Additional research is required to fill literature gaps to assist in optimizing the pharmacist's role in e-consult programs. *Objective:* This study aimed to assess the impact of pharmacist expertise on e-consult outcomes. *Methods:* This study was a retrospective review of all pharmacy e-consults completed by pharmacists at a large academic health system between March 1st, 2020, and August 31st, 2022. This was deemed quality improvement and did not require Institutional Review Board approval. E-consults were identified using a report. Key data collection points included e-consult disease state, ordering provider, pharmacists' specialty, and recommendation result. The primary outcome was the difference in acceptance rates of expert versus non-expert pharmacist recommendations. Secondary outcomes included the overall implementation rate, implementation rate over time, acceptance rate between provider types, time to implementation, and pharmacist response time. Acceptance rates were compared between expert/non-expert dichotomy via Pearson chi-square test. *Results:* A total of 375 e-consults met inclusion criteria and spanned 19 unique disease states. The three most common included diabetes mellitus (27.0%), pain management (13.1%), and mental health (11.0%). Nearly 60% of e-consults were in a disease with an expert. The provider acceptance rate was higher when e-consults were completed by an expert versus non-expert (62.6% versus 39.6% respectively, p = 0.002). The overall implementation rate was 51.8%. Physicians (MD/DOs) accepted the pharmacist's recommendations 55.6% of the time, advanced practice registered nurses (APRNs) 64.7%, physician assistants (PAs) 100.0%, and other professionals 25.0% (p = 0.033). Mean time to recommendation implementation was 16.5 days (SD = 29.4 days). Mean time to pharmacist response was 1.1 days (SD = 1.4 days). *Conclusions:* Comprehensive e-consult programs are more successful when integrating expert pharmacists.

Keywords: E-consult, pharmacist, comprehensive, expertise

Background

In a time defined by rapidly emerging technology and digital health, electronic consults (e-consults) have transformed the way patients receive care from healthcare providers and specialists. An e-consult is an asynchronous dialogue initiated by a healthcare provider seeking a specialist's expert opinion about a patient. The initiating provider sends an encounter through the electronic medical record (EMR) referencing lab reports, images, or other necessary documentation, to a specialist seeking a recommendation about the management of a specific patient. Questions can include any subject regarding the patient's care, from diagnosis of a condition to drug therapy management. Specialists' recommendations for treatment that can be managed by the inquiring provider often have the greatest impact on individual patient's health by providing faster access to care, that is, input from a specialist without a face-to-face appointment.[1] Pharmacists can one of the specialists responding to e-consults within a health system.

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While their involvement may or may not result in faster access to care, pharmacists can improve patient outcomes via e-consults by preventing medication-related problems.

Although pharmacy e-consults have been used in a limited amount of healthcare systems for over a decade, their implementation as usual care is still novel. There have been eleven studies previously published on pharmacy e-consults that were initiated by providers that did not require patient contact/interview. Of these studies, six were completed within the Veterans Affairs System (three related to pain management, one to mental health, one to teratogenic risk, and one to urine drug testing), two within federally qualified health centers (FQHC) (both related to medications for broad disease states), two within multisite primary care clinics associated with a medical center (both providing recommendations for hypertension management), and one acute care setting (provided medication recommendations for patients with dysphagia).[2-11] Nine of the eleven aforementioned studies were retrospective chart reviews, one was a randomized controlled trial, and one included no data. [2-12]

As described above, most of the currently published e-consult programs focus on a singular specialty area such as hypertension or pain management. Additionally, only two of

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the studies included over 300 e-consults and included data that was collected over one year or longer.[5,8]

The two e-consult studies within the FQHCs provided e-consult services for primary care providers at multiple clinic sites within their respective FQHC networks. Additionally both of these e-consult services provided medication related services that were not specific to a specialty area or disease state. E-consults could be related to patient education, adverse drug events, chronic conditions, medication dose adjustments, polypharmacy assessment and more. In the Smith, et al. study from 2021, the pharmacy e-consults were answered by ambulatory care residency-trained pharmacists. The authors did not provide an overall acceptance and/or implementation rate; however, the study included 57 e-consults and reported that at least 74% of e-consults had at least 50% of recommendations implemented.[9] Most recently, a 2023 study by Kuznacic, et al. showed a perceived benefit of pharmacist e-consults based on survey responses by both providers and patients alike. Additionally, of the 513 e-consults evaluated, 84.8% were completed by the pharmacist. Of those completed, 78% included a recommendation to change therapy and 98% of those recommendations were accepted.[8]

These studies laid groundwork for subsequent studies that continued to justify the use of pharmacist e-consults. However, several literature gaps still exist. While most of the published studies identified primary pharmacotherapy problems in their e-consults, results were often limited to a niche or singular disease states such as hypertension, pain management, and mental health, which affected the generalizability of their acceptance rates to a diverse set of disease states. In addition, these studies did not assess the success of their e-consult programs based off the training and expertise of pharmacists making recommendations. The primary purpose of this study was to examine the acceptance rates based off the expertise of the pharmacist making e-consult recommendations across a variety of disease states.

Objectives

The primary objective of this study was to assess the impact of pharmacist expertise on e-consult acceptance rate. Secondary objectives were to (1) quantify the overall implementation rate of pharmacist recommendations, (2) quantify the difference in implementation rate over time, (3) assess time to pharmacist response, (4) assess time to pharmacist recommendation implementation, and (5) quantify the acceptance rate between types of providers.

Methods

Study site

On March 1, 2020, a large academic, safety net, health system initiated a system-wide pharmacy e-consult program. Prior to March 2020, other specialty departments within the health system such as dermatology, cardiology, and pulmonology, had already implemented e-consult services. Any provider within the health system, inpatient or outpatient, can enter a pharmacy e-consult, although it is most utilized by outpatient providers who provide ongoing care to the patient. The health system has 22 outpatient medical offices although it is important to note that not all these locations had a pharmacy presence. Ten facilities had an outpatient community pharmacy. Eight facilities had a pharmacist embedded in clinic at least one day per week with four pharmacists (3.2 full time equivalents (FTE)) embedded in internal/family medicine, one pharmacist (0.8 FTE) in cardiology, one pharmacist (1 FTE) in pain management, and three pharmacists (3 FTE) in a telemedicine clinic for anticoagulation and population health. On the inpatient side, the health system has a total of 12 (11.8 FTE) clinical pharmacy specialists who are present in the following specialties: oncology, hematology, infectious diseases, antimicrobial stewardship, cardiology, critical care, emergency medicine, internal medicine, psychiatry, and pediatrics.

Within the health system, a pharmacy e-consult is initiated by placing a patient-specific order in the EMR regarding a patient-specific question. A pharmacy e-consult order has a dropdown menu with categories including weight management, anticoagulation, diabetes mellitus, dyslipidemia, heart failure, herbal medications, infectious diseases, hematology and oncology, pain management, psychiatry, medication side effects, and a general unspecified category. The e-consult should be able to be answered asynchronously and does not require patient contact. The pharmacist run Medication Management Clinic within the health system assigns the e-consult the specific pharmacist. Whenever possible, they assign e-consult to be answered by a pharmacist who specializes in that disease state. Once assigned, the pharmacist has three business days to provide a written response in the EMR. At time of development of pharmacy e-consults, leadership determined that the following three questions were not appropriate for pharmacy e-consults: (1) medication reconciliation, (2) prior authorization, and (3) cost and formulary alternatives.

Study Design

In this quality improvement approved, retrospective chart review, pharmacy e-consults were identified via a report embedded in the EMR system. E-consults were included if they were initiated between March 1st, 2020, and August 31st, 2022. They were excluded if they did not require a pharmacist's response, for example, if the patient no longer required the pharmacist's recommendation.

Data Collection

Data were retrospectively extracted from the patient's EMR and stored in the encrypted computerized database REDCap™ (Vanderbilt University, Nashville, TN). Demographic data were collected including patient age, gender, and race. Patient information collected included body mass index, estimated

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glomerular filtration rate, and comorbidities. E-consult data collected included time to pharmacist response, acceptance rate, implementation rate, time to implementation, provider type, disease category of the e-consult, completeness of the e-consult, appropriateness of the e-consult, the pharmacist completing the e-consult, and number of pharmacist recommendations that were analyzed for each e-consult.

Definitions

For the purpose of this study, acceptance was defined as the provider's acceptance of the pharmacist's recommendation documented in the EMR within 90 days of the e-consult order date. In order to be classified as accepted, a recommendation did not need to be implemented into the patient's care plan. The provider simply needed to show written intent of implementing the recommendation. Implementation of a recommendation was defined as the recommendation being enacted into the patient's care plan within 90 days of e-consult order date. An expert pharmacist was defined as a pharmacist meeting at least one of the following criteria in the disease state/specialty of the e-consult: (1) at least post-graduate year one residency training, (2) board-certified in their respective disease state, or (3) practiced in specialty area for at least 10 years.

Statistical Analysis

Electronic consult characteristic data were imported into SPSSv25.0 software (IBM Corp., Armonk, NY) and summarized using frequencies and percentages for categorical data and means and standard deviations for numeric data. Acceptance rates were compared between expert/non-expert dichotomy via Pearson chi-square test. Implementation and acceptance were stratified by various characteristics such as disease state and problem type and similarly compared via post-hoc Bonferroni adjusted z-tests performed in the presence of overall significance.

Results

Demographics

A total of 386 e-consults initiated between March 1st, 2020, and August 31st, 2022, were analyzed for inclusion. Ultimately, 375 e-consults were included with 11 meeting exclusion criteria. Baseline demographics and e-consult disease state breakdown are summarized in Table 1. The majority of the e-consults were for female patients (60.3%). E-consult orders for three transgender patients were included. Two were assigned to their sex assigned at birth and one was assigned based on their gender identity. The patient who was assigned to their gender identity was assigned this way because they were on gender-affirming hormone therapy (GAHT) for over six months at the time of their e-consult order, while the other two were not. This method of gender assignment was chosen due to the recommendations of a literature review from Webb, et al., in 2021 which recommended to consider calculating a patient's creatinine clearance based off their gender identify if they had been on GAHT for at least six months.[14] The mean patient age was 56.3 years ± 15.2 years. Race breakdown was similar to that of the communities serviced by the health system. The top three e-consult disease state categories included diabetes mellitus (27.0%), pain management (13.1%), and mental health (11.0%).

Pharmacist Personnel

During the study time period, 24 pharmacists reviewed and responded to e-consults. Of the 24 pharmacists, 14 (58%) were residency-trained, 17 (71%) were board-certified through Board of Pharmacy Specialties, and 15 (63%) had practiced in area of expertise for at least 10 years. This resulted in 100% of pharmacists responding to disease specific e-consults met at least one of the above criteria. While all pharmacists were considered experts in their disease state area, if they answered a question outside of their area of expertise, they were then considered a non-expert.

Primary Outcome

One hundred and ninety-six e-consults with accepted recommendations were answered by expert pharmacists whereas 21 e-consults with accepted recommendations were answered by a non-expert pharmacist (total accepted recommendations n = 217). The acceptance rate for e-consults completed by an expert pharmacist was 62.6% versus 39.6% for those completed by a non-expert pharmacist (p = 0.002).

Secondary Outcomes

The overall implementation rate of the pharmacists' recommendations was 51.8% and the overall acceptance rate was 59.3%. Figure 1 outlines the recommendation implementation rate over each year of the study period. The average number of days from e-consult order placement to the pharmacist's response was 1.1 business days (SD = 1.4 business days). The average number of days from the date of pharmacist recommendation to the date the recommendation was implemented was 16.5 days (SD = 29.4 days).

This study also assessed acceptance rate by ordering provider type. Analyzed provider types included MD/DOs, APRNs, PAs, and a broad 'other' provider type. One hundred unique providers entered pharmacy e-consults during the study period. MD/DOs (225 questions total) accepted 55.6% of pharmacist recommendations, APRNs (133 questions total) accepted 64.7% of recommendations, PAs (5 questions total) accepted 100% of recommendations, and other provider types (4 questions total) accepted 25% of recommendations. Other provider types included two registered nurses and one registered dietician.

Discussion

The e-consult program at this study's institution grew significantly from the initiation of the program in March 2020. Providers placed 124 pharmacy e-consult orders in the first year

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of the program, 169 in the second year, and 196 in the third year, though only 82 were included in data collection in the third year due to the mid-year data collection cutoff date. Providers continue to show more interest in the pharmacy e-consult program. E-consults have proven to be a positive way for providers to have timely access to pharmacist recommendations. Additionally, e-consults may be a way to track pharmacist workload and their respective impact to patients within this health system.

This was the first study to examine the acceptance rates by pharmacist expertise of a broad pharmacy e-consult program at a large academic health system. In this retrospective chart review, a statistically significant difference was found in the acceptance rate between e-consults answered by expert pharmacists and non-expert pharmacists. This showed that expert pharmacists' recommendations were accepted more often by providers. Expert pharmacist recommendations may be accepted more among providers due to differences in rapport or more extensive clinical knowledge on their disease state of expertise. This is an important conclusion for healthcare systems that may be considering the initiation of a pharmacist e-consult program. When contemplating which pharmacists may be involved with a growing e-consult program, incorporating pharmacists that meet the expert criteria defined by this study may lead to a higher provider acceptance rate of their pharmacists' recommendations.

As previously noted, 51.8% of the e-consult recommendations analyzed were implemented into the patient's care plan. Previous pharmacist e-consult studies noted an implementation rate range of 50% to 98%, putting the results from this study at the lower end of the range. This could be due to several factors, such as the maximum 90-day period to demonstrate written acceptance in the EHR, appointment disruptions due to COVID-19, or potential cultural differences between institutions. While four of the six previous pharmacist e-consult studies were conducted in niche/singular disease states where a provider may be consistently working with the same pharmacist, providers at this study's institution cannot select which pharmacist to which the e-consult question is sent. Another explanation could be due to differences in the definition of implementation. The e-consult program at this study's institution included 24 responding pharmacists located across multiple sites within the health system. This study also reviewed e-consults over a longer period of time than previous studies where there may be more provider and pharmacist turnover than was observed in other studies. Though not always noted, other studies may have been defining implementation as any recommendation accepted by a provider, while this study is including only those that were ultimately implemented into the patient's care plan.

This study reviewed pharmacy e-consult recommendation implementation rate over time in addition to the overall implementation rate. It was found that the implementation rate was higher during the first year. This could be due to an early adopter's phenomenon of some providers adopting and utilizing the pharmacy e-consult program before a majority of providers. These early adopters may have been more likely to use and accept pharmacists' recommendations.

Limitations

Several limitations exist for this study. First, the study design may have negatively impacted the actual acceptance and implementation rate due to lack of documentation in the EMR or documentation within 90 days of e-consult. Second, not every recommendation was created equally. While a diabetes mellitus e-consult recommendation regarding an undertreated disease state could be simply initiating a drug therapy, a pain management e-consult recommendation regarding a prolonged opioid taper regimen could take months to consider as implemented into the patient's care. Because providers were unlikely to follow the taper regimen exactly based on many factors, these recommendations appear to have a lower implementation rate than other disease states. Finally, not all e-consult disease state categories assessed in this study had e-consults to analyze. For example, no heart failure consults were ordered and therefore were not available for inclusion in data analysis. Pharmacists embedded in clinics, such as the institution's heart failure pharmacist, may have been receiving questions directly from providers instead of the provider entering an e-consult order.

Conclusion

Comprehensive e-consult programs are more successful when integrating expert pharmacists into the program. Where possible, large academic health systems with comprehensive e-consult programs should include pharmacists who are experts in each disease state area. Since pharmacist e-consults are still a relatively new innovation, further research should be completed regarding e-consult outcomes within each disease state to optimize the pharmacist's involvement.

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Disclaimer: The statements, opinions and data contained in all publications are those of the authors.

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Table 1. Baseline Demographics

Variable/Statistic	E-consults (n = 375)
Mean Age (Years) ±SD	56.3 ± 15.2
Gender - n (%)	
Female	226 (60.3)
Male	149 (39.7)
Race - n (%)	
White	214 (57.1)
Black	131 (34.9)
Missing/Unknown	24 (6.4)
Asian	5 (1.3)
Native Hawaiian/Pacific Islander	1 (0.3)
Consults by Disease States - n (%)	
Diabetes Mellitus	101 (27.0)
Pain Management	49 (13.1)
Mental Health	41 (11.0)
Other	34 (9.1)
Hypertension	24 (6.4)
Dyslipidemia	24 (6.4)
Infectious Diseases	22 (5.9)
Hematology/Oncology	20 (5.3)
Polypharmacy	14 (3.7)
Drug Administration	12 (3.2)
Pulmonary Diseases	6 (1.6)
Medication Allergies	6 (1.6)
Weight Management	5 (1.3)
Thyroid	5 (1.3)
Pregnancy	5 (1.3)
Vitamin Deficiency	3 (0.8)
Renal Dosing	2 (0.5)
Anemia	1 (0.3)
Pediatric	1 (0.3)
Heart Failure	0 (0.0)

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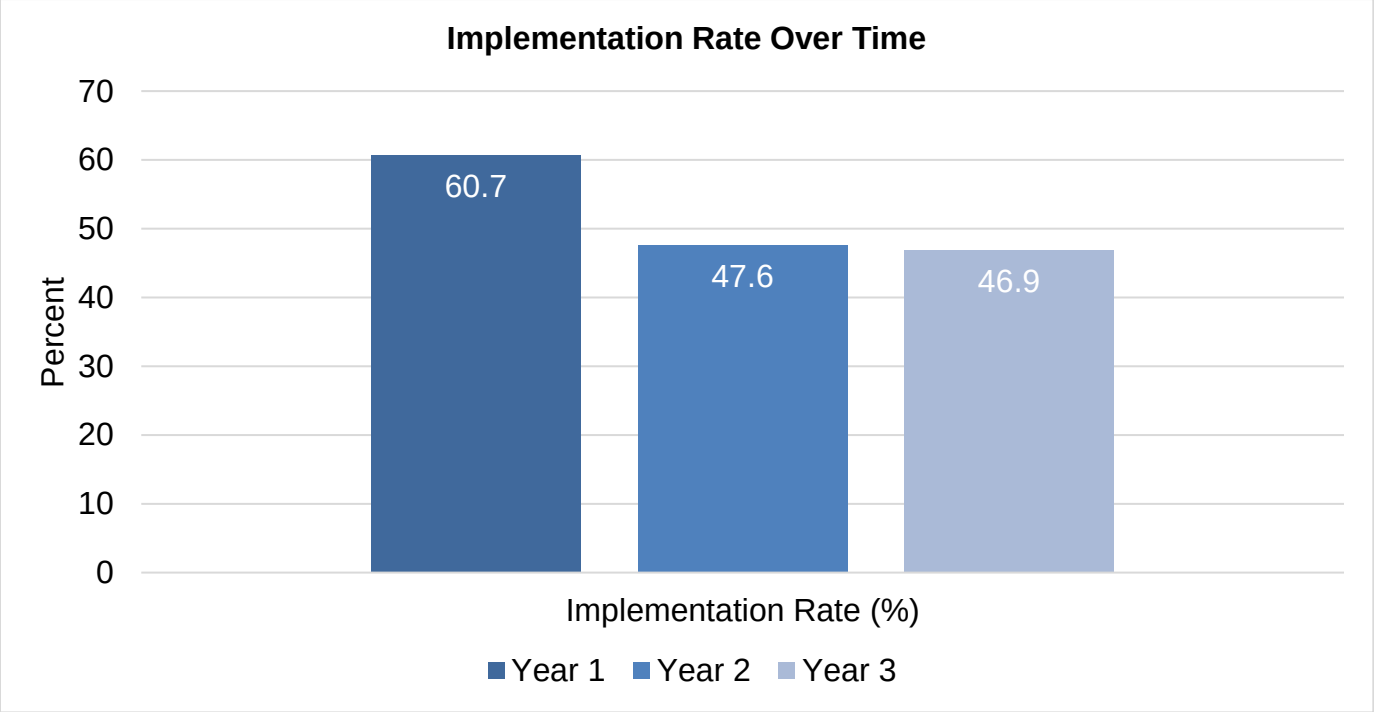
Figure 1


Implementation Rate Over Time
70
60
50
40
30
20
10
0
Percent
60.7
47.6
46.9
Implementation Rate (%)
Year 1
Year 2
Year 3