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Abstract

Drug information (DI) services provided an avenue to expand the role of pharmacists as the medication experts. The focus of DI has shifted from general questions submitted to DI centers to patient-specific questions that optimize care. One method to increase access to pharmacist expertise is through pharmacy eConsults. Pharmacy eConsults provide specialist care for medically complex patients using a patient-centered, asynchronous approach. The purpose of this article is to describe the evolution of consults from formal drug information services and describe one academic medical center's implementation of a pharmacy eConsult service to provide patient-specific DI.

Keywords

drug information, clinical pharmacy, clinical practice, electronic information, teaching/training

Historical Perspective

Drug information (DI) services have played a role in expanding the focus of pharmacists from dispensing medications to demonstrating medication expertise. The establishment of the first DI center in 1962 allowed pharmacists to set the stage to later use their expertise to respond to clinical DI requests, develop educational newsletters, support Pharmacy and Therapeutics committees, develop or support target drug programs, manage or support medication safety programs, and conduct medication use evaluations.^{1,2} A central role of DI centers (DICs) has included experiential education for students and residents. In the mid-1980s and 1990s, centers expanded their scope by offering services to the private sector, such as pharmaceutical companies, retail pharmacies, and managed health care.³ The number of DICs in the United States reached 127 in 1986 and peaked at 218 by 1990.¹⁻³ A survey conducted in 2018 identified 82 active DICs. This article describes the evolution of consults from formal DI services and one academic medical center's implementation of an electronic consult (eConsult) service.

The number of centers in the United States dropped to 75 by 2009.³ Between 2003 and 2009, only 29% of DICs reported an increase in the number of DI questions received.³ A shift in the complexities of inquiries was noted, with 70% describing an increase in the number of complex requests. A complex question was defined as requiring evaluation of the primary literature and critical thinking skills but was not necessarily linked to a specific patient. Patient-specific consults are not described during this time, and 70% of DICs surveyed reported never providing direct patient DI consults at the bedside.³

The integration of computerized health information databases into daily medical care reduced the time required for information retrieval; however, the need for interpretation and cognitive skills to respond to patient-specific inquiries was still required.^{3,4} Knowledge of comorbidities, disease severity, organ function, and concomitant medications is essential for patient-specific consults. Historically, patient-specific information was obtained via verbal history, but with the advent of the electronic medical record (EMR), comprehensive patient data were readily available.

The Evolving Model of DICs

By the mid-1990s, the advent of the World Wide Web likely influenced a decrease in call volume to DICs. Additionally, changes in pharmacy practice, education, and funding sources likely contributed to the reduction in formal DICs.^{1,3}

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In 2015, the American Society of Health-System Pharmacists published guidelines on the Pharmacist's Role in Providing DI.⁵ These guidelines state that to be an effective provider of DI, pharmacists must be able to appropriately synthesize, communicate, document, and apply pertinent information to the patient care situation. These skills translate to the current clinical landscape of the eConsult.

eConsults

eConsult utilizes electronic technology to link providers to specialists to provide patient-specific consults without a face-to-face visit to increase timely access to specialists.⁶ Cruz et al⁷ described electronic endocrine consultations between primary care providers (PCPs) and specialists and demonstrated that 49.3% of patient cases had specialist input within 14 days compared with 21.2% in the prior year. Additional eConsult studies demonstrated increased timely access to specialist care and PCP satisfaction with the specialist eConsult.^{8,9} Access to pharmacists on primary care clinical teams is limited, making pharmacists a prime specialist for an eConsult service. A study on the use of a pharmacist eConsult service independent of a DI service for medication-related questions was conducted within an existing physician specialist eConsult network for PCPs in a federally qualified health center.¹⁰ During the 1-year evaluation period, a total of 57 eConsults containing 123 questions were answered. The most common question categories included adverse drug events/drug interactions, drug or dosage evaluations, and comprehensive medication review (CMR). Seventy-four percent of the eConsult responses by the pharmacists had at least 50% of the recommendations implemented by the provider.

DI and eConsult at University of California, San Francisco Health

In 1968, the DI Service, later renamed the Drug Information Analysis Service (DIAS), was established at the University of California, San Francisco (UCSF) Health. Initially, the service was staffed by rotating hospital pharmacists to respond to questions from UCSF providers. The DIAS later moved under oversight of the UCSF School of Pharmacy. Activities included responding to questions from within UCSF and providing support for the Pharmacy and Therapeutics Committee and later expanded to outside contracts. Dedicated faculty members ran the service as a teaching site for students and residents. In 2007, the DI Analysis Service was renamed the Medication Outcomes Center, and its mission shifted to focus on the conduct of evidence-based, medication-related research to inform decision-making, improve health, and reduce health disparities. By this time, many inpatient services at UCSF

Health included assigned pharmacists to follow patients, who handled DI questions for these services. Some had specialized clinical training or board certification in relevant therapeutic areas. To date, there are few dedicated pharmacists on ambulatory care services within the UCSF Health.

At UCSF Health, physician specialist-to-PCP eConsults started in August 2012 with 9 adult specialties. As of April 2021, a total of 27 adult specialties and 7 pediatric specialties participated. Physician specialist eConsults are available to all UCSF PCPs, and approximately 6000 eConsults are completed annually. Since its inception, the program has completed more than 24 000 eConsults.

In June 2017, the inclusion of pharmacy eConsults at UCSF Health began in response to a request for pharmacy consults in a palliative care clinic. The lack of pharmacists in this practice area created an opportunity for eConsults to address an unmet need. Because UCSF Health had no experience with pharmacy eConsults and the time required to complete these complex consults, a 6-month pilot program was initiated to explore the feasibility. In the pilot, pharmacist faculty from UCSF School of Pharmacy participated in a fee-per-consult model that accounted for time spent per consult. At the end of 6 months, the time spent per consult was evaluated. The time categories (the same as physician eConsult time categories) included the following: <5 minutes, 5 to 10 minutes, 11 to 20 minutes, 21 to 30 minutes, or >30 minutes. All eConsults completed during the pilot were in the >30-minute category. Once it was determined that the service would continue, reimbursement for services was established. To formalize reimbursement, the time per eConsult (>30 minutes) from the pilot was used and cross-referenced with physician specialist eConsult compensation to adopt the same fixed-fee-per-consult received by physicians. At the end of the first year, Care-at-Home providers were added to the pharmacy eConsult service program.

The pharmacy eConsult is an on-demand service and therefore not staffed using the traditional full-time equivalent (FTE) model. The workload is shared among 3 pharmacist faculty, each assigned to specific days per week. These pharmacists have other faculty responsibilities in addition to the eConsult service on the assigned days; they are not dedicated FTEs. The pharmacy eConsult service allows for supervised student and resident learning. The eConsult is delivered through an in-basket message in the EMR. The pharmacy team reviews current and past medical history, medications, and allergies. Referring providers are asked to ensure an accurate and complete medication list. A written response is documented and provided within 72 hours via the EMR.

From the initiation of the program in June 2017 through March 2021, 69 pharmacy eConsults containing 90 questions were received. Of these, 47 involved a review of 5 or more medications. Nine included questions related to supplements, with 1 requiring review of 22 different

Table 1. Pharmacy eConsult Categories.

Categories	Example of inquiry
Drug-drug interactions (n = 23)	Review of risk for drug interactions; dosing of medications with potential CYP450 interactions; review of potential drug interactions with II supplements and oral chemotherapy
Safety (n = 21)	Risks of adding medications in a patient with liver disease; safety of medications in congestive heart failure; safety of trazodone versus melatonin in a patient with alcoholic cirrhosis and chronic pain on opiates
Dosing (n = 15)	Dosing of medications in hemodialysis; design of opioid tapers and cross tapers; conversion of fentanyl and oral opiate to buprenorphine in a patient with ALS; pharmacogenomics of buprenorphine and possible effect on dosing.
Therapeutics (n = 13)	Antidepressant of choice in a patient with QTc prolongation on concurrent medications that may contribute to QTc prolongation; antibiotic of choice in a patient based on available sensitivity report; muscle relaxant of choice in a patient with ALS; stage 4 chronic kidney disease and history of delirium; role of centrally acting ACE inhibitors in prevention of dementia
Other (n = 10)	Request for a comprehensive medication review in a patient with known and unrecorded supplement use and safety in chronic kidney disease; comprehensive medication review to identify potential source of a drug interaction (likely unrecognized serotonin syndrome)
Formulation (n = 6)	Recommendation for medications that can be crushed; palatability of liquid formulations
Formulary coverage (n = 2)	Alternative agents for pain in the setting of inadequate formulary coverage

Abbreviations: ACE, angiotensin-converting enzyme; ALS, amyotrophic lateral sclerosis; QTc, corrected QT interval.

supplements. Seven pharmacy eConsults were received from nurse practitioners and 62 from physicians. Two physicians submitted approximately 48% (n = 33) of the pharmacy eConsults. Most of the pharmacy eConsults came from palliative care providers.

Table 1 describes the types of clinical questions referred for pharmacy eConsult. A CMR and review for potential drug interactions was conducted for all pharmacy eConsults as standard of care.

Discussion

With the shift from formal DI services and the need for pharmacist expertise in areas not currently staffed by pharmacists, pharmacy eConsults can provide asynchronous patient-centered DI to fill this gap. Most PCPs do not have a clinical pharmacist as a full-time member of the care team because of cost, space, and resource constraints. Pharmacy eConsults allow providers to use the medication expertise of pharmacists to enhance safety and optimize therapeutic effectiveness. Other pharmacy eConsult services in primary care, mental health, and pain management have been shown to improve access to care and medication optimization, both of which are goals of our pharmacy eConsult.^{8,10,11}

The pharmacy eConsult at the UCSF Health provides service to palliative care and home-based PCPs. The most common eConsults address drug-drug interactions, medication safety, and therapeutics. These medication-related issues align with those documented in the study by Smith et al.¹⁰ The average time to complete an eConsult in our program is more than 30 minutes because the pharmacists conduct a CMR, including a drug-drug interaction screen and a literature search for each consult. The pharmacy

eConsult response includes a recommendation, alternative options, and evidence-based references. Physicians submitted 90% of the pharmacy eConsult requests, compared with requests from advanced practice providers (10%); the majority came from the Palliative Care Service, which has more physicians than advanced practice providers (17 and 4, respectively). This contrasts with the findings of Smith et al,¹⁰ in which advanced practice nurses were the predominant providers and sent 3 times the number of eConsults and questions compared with physician providers.

Improved medication outcomes and medication safety in patients with chronic diseases who are managed by pharmacists are well documented in the literature.¹¹⁻¹⁵ Our program demonstrates how pharmacy eConsults can serve as a mechanism to expand access to the clinical and DI expertise of the pharmacist when dedicated, service-focused pharmacist resources are scarce. Our asynchronous, non-FTE-based model allowed rapid initiation using pharmacist faculty (who often have a more flexible schedule) as well as accelerated growth once the pilot phase was completed. This ability to be nimble with staffing and to use a fixed fee-for-consult reimbursement model provides a feasible model for asynchronous pharmacy expertise in primary care in an academic medical center.

Conclusion

A move away from traditional DI centers and services is occurring; however, the need for DI in primary care has increased and requires responses to more complex inquiries. Pharmacy eConsults provide a mechanism to provide DI as part of or separate from a traditional DI service/center for medically complex patients using a patient-centered

approach that can be scaled and accomplished in an asynchronous manner.

Declaration of Conflicting Interest

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