Original Research

Assessment and use of drug information references in Utah pharmacies

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Abstract

Objective: To determine which drug references Utah pharmacists use most frequently. To determine which types of drug information questions are most commonly asked, and whether Utah pharmacists have access to adequate references to respond to these questions.

Methods: A 19-question survey was created using Qualtrics, LLC (Provo, Utah) software. An electronic survey link was sent to 1,431 pharmacists with a valid e-mail address listed in the Department of Professional Licensing database. Questions focused on available references in the participant's pharmacy, how current the references are, and the participant's use of the references. Surveys were analyzed for participants practicing in either community or hospital pharmacies in the state of Utah.

Results: A total of 147 responses were included in the analysis. Approximately 44% of respondents practiced in the community, and 56% practiced in a hospital setting. The most commonly used references by Utah pharmacists are Micromedex, Lexicomp, UpToDate, Clinical Pharmacology, and Drug Facts & Comparisons. Pharmacists in the community frequently receive questions related to adverse drug reactions, drug interactions, and over-the-counter medications. Pharmacists in the hospital frequently receive questions relating to dosage and administration, drug interactions, and adverse drug reactions. About 89% of community pharmacists and 96% of hospital pharmacists feel available references are adequate to answer the questions they receive.

Conclusions: Utah pharmacists generally use large reference suites to answer drug information questions. The majority of pharmacists consider the references available to them to be adequate to answer the questions they receive.

Keywords

Drug Information Services; Professional Practice; Pharmacies; Pharmacy Service, Hospital; Pharmacists; Surveys and Questionnaires; Utah

INTRODUCTION

Pharmacists are an essential source of drug information for patients and other health care providers.[1-6] In the community, pharmacists are in a unique position to provide drug-related information and counseling because they see patients regularly and build personal relationships with them.[1] These trusted relationships create an environment where patients are more comfortable asking questions that may affect health outcomes. In addition, pharmacists often have access to a more complete medication history than other health care professionals because patients may see multiple providers, but usually fill prescriptions at the same pharmacy.[7] This allows pharmacists to integrate their knowledge from personal interaction with patients and records kept by the pharmacy to provide the most pertinent drug information. In an institutional setting, other professionals often rely on pharmacists to provide

medication information.[5,6] The 2013 American Society of Health-System Pharmacists (ASHP) national survey of pharmacy directors found that 93.2% of hospital respondents reported using pharmacist consultations for the provision of drug information.[6]

Evidence-based references are important sources of drug information for community and hospital pharmacists. Drug information resources can be quite expensive and some require internet access, which may limit availability.[1] Print drug information references quickly become outdated due to advances in research and development of new drug therapies.[8,9] As a result, it can be difficult for pharmacists to obtain access to the evidence-based references they need to practice.[1] Given that other health care providers rely on pharmacists to provide drug information, not having the correct resources available may impact decisions made by the requesting providers.[2,7]

Several surveys have been conducted over the past 30 years to assess which drug information resources pharmacists are able to access. Some of these studies concluded that pharmacists may not have sufficient access to important references.[3,10] Only a few aimed at determining the types of questions answered by pharmacists, which would be necessary to assess whether resources were adequate. Additionally, the most recent survey was published in 1992, before the "electronic era" of medical references.[4] All of these factors limit the utility of the results.[3,10] There have not been studies evaluating which drug information references pharmacists have access to throughout the state of Utah. Patients have easier access to pharmacists than primary care providers. According to the National Association of Chain Drug Stores, 89% of

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people live within 5 miles of a pharmacy, where they have access to the expertise of the community pharmacist. There are approximately 4.1 billion prescriptions filled each year in retail pharmacies throughout the United States and about 31 million filled in Utah.[8] These data show that patients have frequent interactions with pharmacists in the community setting. Additionally, a survey conducted by Pedersen and colleagues suggests that front-line pharmacists provide drug information to prescribers in 94.9% of US hospitals.[5] By addressing important drug-related questions, pharmacists may help reduce the high costs of drug-related morbidity and mortality.[7,11]

The purpose of this research study is to determine which references, if any, Utah pharmacists use most frequently, and the most common question types received by Utah pharmacists. Survey data will also allow us to understand whether pharmacists in Utah have access to adequate references to respond to drug information requests.

METHODS

A pretested survey was developed using Qualtrics, LLC (Provo, Utah) software. An electronic link to the survey was sent via e-mail to all pharmacists without license restrictions and a valid e-mail address listed in the Department of Professional Licensing database (n=1,431). Reminder e-mails to respond to the survey were sent one month after the initial e-mail. The e-mail explained the purpose of the survey. All survey responses were anonymous. The 19 survey questions focused on which references were available in the participant's pharmacy, how current the references are, and the participant's use of the references (e.g., format, frequency of use). The references included in the survey were selected based on previously published research and the authors' experience in drug information practice. Demographic and practice site data were also collected. Surveys were analyzed for participants practicing in the state of Utah in either community or hospital settings. To assess nonresponse bias, early responders were compared with late responders in all analyses, assuming late responders provided the most accurate reflection of nonresponders.[12] This research was deemed exempt by the University of Utah Institutional Review Board.

Statistical Analysis

Descriptive statistics were used to summarize the data. For categorical variables, we examined associations between the use/availability/perceived sufficiency of references and practice setting using chi-square and Fisher's Exact Test, as appropriate. We also examined the association between type of question received and practice setting with chi-square tests. We compared percentage of the source of questions (e.g., patients, providers, other health care professionals) between community and hospital-based pharmacists with a Mann-Whitney U test. We compared practice setting categories and percentage of questions received by source using ANOVA. Post-hoc analyses were conducted using Tukey's test and Dunn's post-hoc multiple comparisons of the Kruskal-Wallis test.[13-15] We also performed logistic regression to estimate the impact of practice setting and time in profession on the odds of

perceived sufficiency of available references. Firth's logit was used to adjust for separation of data. We assessed the logistic regression model with a goodness of fit test.

All data were analyzed in SAS v9.3 (SAS Institute, Cary, NC), Stata IC 13.0 (StataCorp, College Station, TX), and R v0.98.1103 (R Core Team, Vienna, Austria) and significance was determined a priori to be <0.05.

RESULTS

Of the 1,431 pharmacists to whom the survey was sent, 218 pharmacists responded (15.2%). Of these, 31 surveys were excluded because the respondent does not reside in Utah. An additional 40 surveys were excluded because the respondent primarily works in a setting other than community or hospital. The total number of responses included in our analysis was 147. About 44% of respondents practice in community, while about 56% of respondents practice in a hospital setting. The majority of community pharmacist respondents work for a national chain (33%) and health-system clinic (27%, Tables 1 and 2). The majority of hospital pharmacist respondents practice in a not-for-profit community hospital (46%) or academic medical center (42%, Tables 1 and 2). Most respondents are located in an urban area (56%). Fewer respondents are

Table 1. Demographics of survey respondents	
Community pharmacist respondents	
Practice setting	N (%)
National Chain	20 (33)
Health System or Clinic	16 (27)
Independent	11 (18)
Grocery Store	8 (13)
Mass Merchandiser	4 (7)
Wholesaler	1 (2)
Not answered	5
Number of prescriptions filled per day	
<100	8 (13)
101-300	28 (47)
301-500	16 (27)
501-800	6 (10)
>800	2 (3)
Years in practice	
< 1	6 (10)
1-5	25 (42)
6-10	14 (23)
> 10	15 (25)
Hospital pharmacist respondents	
Practice setting	N (%)
Community, not for profit	33 (46)
Academic Medical Center	30 (42)
Community, for profit	6 (8)
Government	3 (4)
Critical Access	0 (0)
Not answered	10
Number of beds	
<50	6 (8)
50-99	3 (4)
100-199	6 (8)
200-299	14 (19)
300-399	8 (11)
400 or more	24 (33)
Years in practice	
< 1	4 (6)
1-5	23 (32)
6-10	20 (28)
> 10	25 (35)

Table 2. Practice setting of survey respondents compared with national data (%)

Practice setting	Survey	National Pharmacy Workforce
Nongovernment Hospital	26.5	23.7
Government Hospital/Health System	22.4	5.7
Chain Pharmacy	13.6	19.2
Clinic Pharmacy	10.9	4
Independent Pharmacy	7.5	9.9
Grocery Store	5.4	7.9
Mass Merchandiser	3.4	7.1

located in an urban cluster (6%) or rural area (11%).

Definitions for urban, urban cluster, and rural were based on US Census Bureau setting definitions.[16]

Table 3 lists references accessed by community or hospital pharmacists at least weekly. The most frequently used references in community pharmacies were Micromedex (93%), Lexicomp references (81%), Clinical Pharmacology (67%), Drug Facts & Comparisons (65%), and Pharmacist's Letter (60%). The most frequently used references by hospital pharmacists were Micromedex (95%), Lexicomp references (91%), UpToDate (87%), Clinical Pharmacology (54%), and Drug Interaction Facts (46%). There were statistically significant differences in how frequently community and hospital pharmacists used the following references (community vs hospital): Drug Facts and Comparisons (65% vs 25%, p=0.0012), UpToDate (42% vs 87%, p=0.0042), and Pharmacist's Letter (60% vs 9%, p<0.0001).

Overall, 78% of hospital respondents have full internet access, while 55% of community respondents have full internet access. References widely available electronically through reference suites (e.g., Facts and Comparisons, Lexicomp, journals) were accessed electronically, while

pharmacotherapy references were used primarily in print. Survey respondents indicated they were approximately twice as likely to access references electronically.

According to the survey responses, the top 5 types of questions received by community pharmacists are adverse drug reactions (58.5%), drug interactions (58.5%), over-the-counter medications (44.6%), dosage and administration (36.9%), and cost (32.3%). The top 5 questions received by hospital pharmacists are dosage and administration (63.4%), drug interactions (42.7%), adverse drug reactions (41.5%), stability and compatibility (41.5%), and therapeutics and pharmacology (40.2%). Compared with hospital pharmacists, community pharmacists are more likely to be asked questions based on adverse drug reactions (P = 0.04), cost (p=0.0001), drug identification (p=0.02), pregnancy/fertility/lactation (p=0.0016), and over-the-counter medications (p<0.0001). Compared with community pharmacists, hospital pharmacists are more likely to be asked questions based on dosage and administration (p=0.0014), stability and compatibility (p<0.001), and therapeutics and pharmacology (p<0.001). These results are further described in Table 4.

Community pharmacists are asked more questions by patients compared with hospital pharmacists (76.8% [SD=15.6] vs 12% [SD=15.1], p<0.0001). Hospital pharmacists are asked more questions by providers compared with community pharmacists (41.6% [SD=22.4] vs 13.4% [SD=11.1], p<0.0001). Hospital pharmacists are also asked more questions by other health care professionals compared with community pharmacists (46% [SD=24] vs 8.8% [SD=7.9], p<0.0001).

Fifty-six percent of respondents reported that they sometimes use references to answer questions and 16% report they use a reference most of the time. However, 28% of pharmacist respondents reported that they rarely or

Table 3. Frequently used references	Community	Hospital
Reference	N (%)	N (%)
AHFS Drug Information	12 (23)	54 (70)
American Journal of Health-System Pharmacy	7 (13)	39 (52)
Annals of Pharmacotherapy	7 (13)	40 (53)
Clinical Pharmacology	22 (40)	28 (37)
Drug Facts and Comparisons	41 (72)	56 (73)
Drugs in Pregnancy and Lactation: A Reference Guide to Fetal and Neonatal Risk (Briggs)	20 (35)	59 (77)
Goodman and Gilman The Pharmacological Basis of Therapeutics	10 (19)	40 (53)
Handbook of Nonprescription Drugs: An Interactive Approach to Self-Care	12 (22)	19 (25)
JAMA	13 (25)	54 (71)
Koda-Kimble and Young's Applied Therapeutics: The Clinical Use of Drugs	4 (8)	17 (22)
Lexicomp references	33 (56)	71 (92)
Medical Dictionary	20 (37)	52 (69)
Micromedex	27 (48)	70 (92)
Natural Medicines Comprehensive Database	39 (66)	45 (60)
Natural Standard Herb & Supplement Guide	19 (34)	30 (40)
New England Journal of Medicine	14 (26)	57 (76)
Pediatric Injectable Drugs (The Teddy Bear Book)	3 (6)	39 (51)
Pharmacist's Letter	43 (71)	25 (33)
Pharmacotherapy (Journal)	7 (13)	42 (56)
Pharmacotherapy: A Pathophysiologic Approach (DiPiro)	12 (23)	35 (46)
Pharmacy Times	36 (62)	27 (36)
Physicians' Desk Reference	8 (15)	27 (36)
Remington's Pharmaceutical Sciences	5 (9)	16 (21)
United States Pharmacopoeia National Formulary (USP-NF)	22 (42)	39 (51)
UpToDate	22 (41)	74 (96)

Table 4. Types of Questions (%) Received			
Question category	Community (n=65)	Hospital (n=82)	P value*
Adverse drug reaction	58.5	41.5	0.0406
Cost	32.3	7.3	0.0001
Dosage and Administration	36.9	63.4	0.0014
Drug Availability	9.2	8.5	0.8830
Drug Interaction	58.5	42.7	0.0570
Foreign Drugs	0	0	NA
Identification	7.7	0	0.0155
Pharmacokinetics and Pharmacodynamics	6.2	12.2	0.2153
Pharmacy Law	0	1.2	1
Pregnancy, Fertility, and Lactation	20	3.7	0.0016
Stability and Compatibility	1.5	41.5	< 0.0001
Therapeutics and Pharmacology	4.6	40.2	< 0.0001
Toxicity and Poisoning	0	1.2	1
Over-the-Counter Medications	44.6	2.4	< 0.0001
*Types of questions received were compared between community and hospital-based pharmacists with chi-square tests			

never use references to answer questions. There was no statistically significant difference between community and hospital pharmacists regarding if references are used to answer questions. About 89% of community pharmacists and 96% of hospital pharmacists feel their references are adequate for the majority of the questions they receive. Overall, pharmacists in hospital settings have 2.29 (95%CI 1.15:4.57) times the odds of being in a higher category of perceiving reference sufficiency as compared with community settings (p=0.0184). Pharmacists practicing for more than 5 years have 2.46 (95%CI 1.23:4.92) times the odds of perceiving references as being sufficient as compared with those with 5 years or less experience (p=0.0111). After adjusting for multiple comparisons, there were no differences in any result between early and late survey responders.

DISCUSSION

Overall Utah pharmacists think the references available to them in their practice setting are sufficient to answer the majority of questions they receive. This seems reasonable given the questions Utah pharmacists report receiving and the references available to them. The types of questions received in Utah community pharmacies mirror those previously reported.[4] As expected, hospital pharmacists were more likely to receive questions from health care professionals, while community pharmacists were more likely to receive questions from patients. Additionally, the types of questions Utah pharmacists reported receiving align with the respective practice setting. These results support the validity of our survey. Nonresponse bias was not an issue in this survey, as there were no differences in results between early and late responders.

The survey results indicate a shift towards the use of electronic references over print references. Much of the currently published literature describing the use of drug information resources predates the time when electronic references were widely available. Similar studies conducted in Connecticut and Michigan occurred in the 1970's.[7,10] The most recent survey specifically evaluating the use of drug information references in the United States was conducted in Louisiana in the early 1990's and did not assess the use of electronic references.[4] The American Society of Health-System Pharmacists conducts regular surveys regarding the

practice of pharmacy in the hospital setting. In the 2001 survey, about half of the respondents indicated that they provided some form of electronic drug information resource.[11] By 2007, 97.6% of the respondents indicated that their pharmacists had full internet access. Only 6.9% did not provide any electronic drug information resources.[5] In the most recent survey, 77.5% of respondents indicated that they have electronic drug information resources available throughout the hospital, and 52.1% have references embedded in the computerized provider order entry system.[6]

While this survey represents one of the few surveys regarding drug information references, it is limited in scope to pharmacists in the state if Utah in hospital or community settings. The majority of respondents practice in an urban setting, so this may not provide an accurate reflection of rural practice. Based on the National Pharmacist Workforce Survey, pharmacists practicing in community clinics and government hospitals may be overrepresented in our survey, while pharmacists practicing in mass merchandisers may be under represented. Due to the small sample size there may be other issues with representativeness that we did not detect.

CONCLUSIONS

Utah pharmacists generally use large reference suites to answer drug information questions. Most pharmacists use references at least some of the time to respond to drug information inquiries. The majority of pharmacists consider the references available to them to be adequate to answer the questions they receive.

CONFLICT OF INTEREST

KM has received honorarium for preparing board recertification materials and core therapeutics modules for ASHP. EM has received honorarium for board certification courses through ASHP/ACCP. The authors have no other conflicts of interest to disclose.

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