ASHP national survey of pharmacy practice in hospital settings: Prescribing and transcribing—2007

CRAIG A. PEDERSEN, PHILIP J. SCHNEIDER, AND DOUGLAS J. SCHECKELHOFF

Purpose. Results of the 2007 ASHP national survey of pharmacy practice in hospital settings that pertain to prescribing and transcribing are presented.

Methods. A stratified random sample of pharmacy directors at 1264 general and children's medical-surgical hospitals in the United States were surveyed by mail. SMG Marketing Group, Inc., supplied data on hospital characteristics; the survey sample was drawn from SMG's hospital database.

Results. The response rate was 42.0%. The use of nearly all formulary management techniques has declined since 2001 in favor of the use of clinical practice guidelines to promote rational drug therapy. Retrospective methods to improve prescribing are being replaced by concurrent methods including the provision of drug information to prescribers by pharmacists, consultations with prescribers, and the continued gradual adoption of computerized prescriber-order-entry systems with decision support. The trends toward more electronic communication and ease of reference availability and away from resource-intensive methods continue to grow. Accreditation standards prompted the implementation of safe medication practices as shown by the rapid increase in medication reconciliation and the reading back of oral orders to improve prescribing and transcribing.

Conclusion. The 2007 ASHP survey results indicate that pharmacists are responding to changes in the health care system to find appropriate ways to improve medication use at the prescribing and transcribing steps of the medication-use system.

Index terms: American Society of Health-System Pharmacists; Data collection; Hospitals; Pharmaceutical services; Pharmacists, hospital; Pharmacy, institutional, hospital; Prescribing; Protocols; Quality assurance; Rational therapy

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The ASHP national survey of pharmacy practice in hospital settings focuses on the role pharmacists play in managing and improving the medication-use process. The national surveys are organized according to six steps in the medication-use process: prescribing, transcribing, dispensing, administration, monitoring, and patient education. Each year, the survey focuses on two steps in the medication-use process. The 2007 survey represents the first part in the cycle and is concerned with prescribing and transcribing. When combined, the surveys represent a composite picture that examines the current role pharmacist's play in managing and improving the six steps in the medication-use process.

In assessing the role of pharmacists in prescribing and transcribing, the present study sought to describe the process of formulary system management, the use of clinical practice guidelines, medication-use evaluation activities, the extent of pharmacist consultations, the provision of drug information to prescribers, the evaluation of medication orders, the use of computerized prescriber-order-entry (CPOE) systems and electronic medical records (EMRs), and actions taken to ensure accurate transcription of medication orders.

CRAIG A. PEDERSEN, PH.D., FAPHA, is Associate Professor; and PHILIP J. SCHNEIDER, M.S., FASHP, is Clinical Professor and Director, Latiolais Leadership Program, College of Pharmacy, The Ohio State University, Columbus. DOUGLAS J. SCHECKELHOFF, M.S., FASHP, is Vice-President, Office of Professional Development, American Society of Health-System Pharmacists (ASHP), Bethesda, MD.

Address correspondence to Dr. Pedersen at the College of Pharmacy, The Ohio State University, 500 West 12th Avenue, Columbus, OH 43210-1291 (pedersen.18@osu.edu).

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In addition, this study profiles acquisition cost of pharmaceuticals, describes human resource commitments and turnover, and estimates national vacancy rates for hospital pharmacist positions. Hours of inpatient pharmacy operations per week and the extent to which pharmacy staff work from home are also presented.

Methods

The extent to which pharmacists are involved in the prescribing and transcribing aspects of the medication-use process was assessed using methods similar to those used in previous ASHP surveys.[1-6]

Questionnaire development. The 2007 questionnaire was developed and pretested using procedures suggested by Dillman.[7] Questions from previous surveys that pertained to topics of interest in this survey were evaluated for clarity and response. As with past surveys, data on hospital characteristics (i.e., number of beds, U.S. Census Bureau region, ownership, U.S. Census Bureau metropolitan statistical area status,[8] medical school affiliation status) were obtained from the SMG Marketing Group, Inc., 2007 hospital database.[9]

Survey sample. From the SMG database of 6945 hospitals, a sampling frame of 4958 general and children's medical-surgical hospitals in the United States was constructed. Specialty, federal, and Veterans Affairs hospitals were excluded. Hospitals were stratified by size before sampling, and random samples of hospitals within each stratum were taken to construct the sample of 1300 hospitals. Unlike previous surveys,

Table 1.
Size, Location, Ownership, and Affiliation of Respondents' and Nonrespondents' Hospitals[a]

Characteristic	Respondents		Nonrespondents		Surveyed		Population	
	n	%[b]	*n*	%[b]	*n*	%[c]	*n*	%[d]
All hospitals	531	42.0	733	58.0	1264	100.0	4958	100.0
Staffed beds[e]								
<50	110	38.2	178	61.8	288	22.8	1617	32.6
50–99	82	42.7	110	57.3	192	15.2	784	15.8
100–199	75	38.9	118	61.1	193	15.3	1109	22.4
200–299	104	52.8	93	47.2	197	15.6	637	12.8
300–399	75	38.1	122	61.9	197	15.6	393	7.9
≥400	85	43.1	112	56.9	197	15.6	418	8.4
Occupied beds								
<50	193	38.4	309	61.6	502	39.7	2491	50.3
50–99	65	44.5	81	55.5	146	11.6	777	15.7
100–199	116	46.8	132	53.2	248	19.6	906	18.3
200–299	81	41.1	116	58.9	197	15.6	440	8.9
300–399	33	44.0	42	56.0	75	5.9	159	3.2
≥400	43	44.8	53	55.2	96	7.6	184	3.7
Region[f]								
West	94	40.9	136	59.1	230	18.2	935	18.9
Midwest	166	48.0	180	52.0	346	27.4	1438	29.0
South	186	38.3	300	61.7	486	38.4	1893	38.2
Northeast	85	42.1	117	57.9	202	16.0	692	14.0
MSA status								
Within an MSA	353	43.2	464	56.8	817	64.6	2747	55.4
Outside an MSA	178	39.8	269	60.2	447	35.4	2211	44.6
Ownership								
For profit	67	40.6	98	59.4	165	13.1	729	14.7
Nonprofit	464	42.2	635	57.8	1099	86.9	4229	85.3
Medical school affiliation								
Yes	182	44.4	228	55.6	410	33.2	1169	24.3
No	336	40.7	490	59.3	826	66.8	3651	75.7

[a]From the SMG hospital database. MSA = metropolitan statistical area.
[b]Calculated as a percentage of all hospitals surveyed in the category.
[c]Calculated as a percentage of all hospitals surveyed.
[d]Calculated as a percentage of all hospitals.
[e]$\chi^2 = 13.305$, $df = 5$, $p = 0.021$.
[f]$\chi^2 = 7.968$, $df = 3$, $p = 0.047$.

Table 2.
Percentage of Hospitals Using Formulary System Management Techniques

Characteristic	All Hospitals			Staffed Beds[a]					
	2001[6] (*n* = 531)	2004[3] (*n* = 492)	2007 (*n* = 530)	<50 (*n* = 109)	50–99 (*n* = 82)	100–199 (*n* = 75)	200–299 (*n* = 104)	300–399 (*n* = 75)	≥400 (*n* = 85)
Minimal duplication of multisource products	96.3	92.9	87.2	84.4	84.1	90.7	91.3	85.3	89.4
Pharmacist interventions designed to help monitor prescriber compliance with established medication-use policies	89.0	81.2	73.9[b]	62.4	69.5	76.0	84.6	86.7	91.8
Education of prescribers regarding medication costs	84.5	65.2	64.5	63.3	52.4	68.0	65.4	70.7	75.3
Minimal duplication of therapeutically equivalent products	90.7	83.2	80.3[c]	74.3	72.0	85.3	87.5	89.3	85.9
Therapeutic interchange policy	83.5	90.9	88.7[d]	80.7	90.2	90.7	96.2	96.0	92.9
Regular review of new therapeutic agents	76.8	70.3	68.3[e]	50.5	58.5	76.0	87.5	88.0	87.1
Regular review of therapeutic categories	62.2	56.2	52.9[f]	34.9	36.6	69.3	64.4	76.0	69.4
Regular review of nonformulary drugs	48.2	54.9	52.5[g]	39.4	46.3	50.7	72.1	78.7	64.7
Regular evaluation of physician adherence to medication-use policies	37.5	33.5	30.7[h]	15.6	22.0	28.0	54.8	48.0	58.8
Prior approval required for nonformulary product use	26.2	28.0	28.3[i]	16.5	29.3	22.7	45.2	40.0	49.4

[a]Data for 2007.
[b]Uncorrected $\chi^2 = 27.9261$, $df = 5$, design-based $F(4.05, 2120.54) = 6.7455$, $p < 0.0001$.
[c]Uncorrected $\chi^2 = 14.7862$, $df = 5$, design-based $F(4.06, 2127.38) = 3.5319$, $p = 0.0067$.
[d]Uncorrected $\chi^2 = 18.3704$, $df = 5$, design-based $F(4.04, 2117.32) = 4.4984$, $p = 0.0012$.
[e]Uncorrected $\chi^2 = 58.7008$, $df = 5$, design-based $F(4.04, 2118.52) = 14.1767$, $p < 0.0001$.
[f]Uncorrected $\chi^2 = 61.8629$, $df = 5$, design-based $F(4.10, 2146.29) = 14.6050$, $p < 0.0001$.
[g]Uncorrected $\chi^2 = 37.9570$, $df = 5$, design-based $F(4.09, 2142.35) = 9.0160$, $p < 0.0001$.
[h]Uncorrected $\chi^2 = 63.1301$, $df = 5$, design-based $F(4.13, 2164.88) = 14.4895$, $p < 0.0001$.
[i]Uncorrected $\chi^2 = 35.9799$, $df = 5$, design-based $F(4.12, 2159.02) = 8.2910$, $p < 0.0001$.

we included 300 hospitals with fewer than 50 beds to account for historically lower response rates in hospitals of this size. Two hundred hospitals were sampled in each of the other hospital size categories, as was done in previous surveys.

In March 2007, each of the 1300 hospitals was called by an independent firm (Reliance Teleservice, Arnold, MD) to verify the name of the pharmacy director. After eliminating closed hospitals, hospitals that no longer had pharmacies, hospitals without a permanent director of pharmacy, and pharmacies unwilling to provide the director of pharmacy's name, the adjusted sample comprised 1264 hospitals.

Data collection. Pharmacy directors in the sample were contacted up to six times during the survey period. An announcement letter was sent to the entire sample in May 2007, which was followed one week later by the first survey mailing. To increase the response rate, respondents were entered into a drawing for three iPod nanos (Apple Inc., Cupertino, CA) as an incentive. Two weeks after the initial survey mailing, reminder postcards were mailed to the entire sample. The surveys were mailed a second time to nonrespondents in early June 2007. The survey was sent a third time by UPS to remaining nonrespondents at the end of June 2007. Reliance Teleservice made a final telephone contact with nonrespondents during July 2007.

Data analysis. Each member of the sample was assigned a unique identification number that allowed the survey response to be matched with hospital characteristics in the SMG database.

As with previous surveys, data in this report are presented by hospital size on the basis of staffed beds to more closely align with data presented by the American Hospital Association.[10]

Because of the stratified random sampling procedure, it was necessary to employ a design-based analysis.[11] This technique produces population estimates that are much more accurate than not accounting for the complex sampling design. In addition, this technique improves the reliability of the population estimates and the estimates for the hospital size subdomain. Stratified random sampling also ensured that the sample was representative of the population.

Data were entered using SPSS, version 15.0 (SPSS Inc., Chicago, IL). Data were converted to an Intercooled Stata, version 7, readable format using DBMS Copy, version 7 (Conceptual Software, Inc., Houston, TX). All non-design-based analyses were conducted using SPSS 15.0. All design-based analyses were conducted with Stata 7 using the set of survey commands. To account for the sampling method, weights were assigned to respondents to adjust their contribution to the population estimate. The weight was 14.70 for hospitals with fewer than 50 staffed beds, 9.56 for hospitals with 50–99 beds, 14.79 for hospitals with 100–199 beds, 6.13 for hospitals with 200–299 beds, 5.24 for hospitals with 300–399 beds, and 4.92 for hospitals with 400 or more staffed beds. The strata were the categories based on the number of staffed beds, and the finite population correction was the total number of hospitals in the population (4958).

Descriptive statistics were used extensively. Chi-square analysis and analysis of variance or regression were used to examine how responses differed as a function of hospital characteristics. The a priori level of significance was set at 0.05.

Results and discussion

Overall, 531 usable surveys were returned, yielding a response rate of 42.0%, which is substantially higher than that of most mailed questionnaires.[12] This response rate is higher than that for the 2006 survey,[1] despite the increase in sampling of the

Table 3.
Percentage of Hospitals with Clinical Practice Guidelines (CPGs) That Include Medications and Pharmacist Involvement in Their Use

Characteristic	All Hospitals			Staffed Beds[a]					
	2001[6] (*n* = 520)	2004[3] (*n* = 493)	2007 (*n* = 531)	<50 (*n* = 110)	50–99 (*n* = 82)	100–199 (*n* = 75)	200–299 (*n* = 104)	300–399 (*n* = 75)	≥400 (*n* = 85)
CPGs include medications	68.8	83.1	84.1[b]	77.3	84.1	81.3	93.3	92.0	96.5
Pharmacists involved in CPG development and implementation	. . .[c]	95.3	93.2	90.6	88.4	93.4	99.0	98.6	95.1

[a] Data for 2007.
[b] Uncorrected $\chi^2 = 18.1022$, $df = 5$, design-based $F(4.03, 2114.51) = 4.4397$, $p = 0.0014$.
[c] Data not collected.

Table 4.
Percentage of Hospitals with Programs on Joint Commission Core Measures of Compliance and Pharmacists Who Participate in the Program (*n* = 531)[a]

Characteristic	Patients with Acute Myocardial Infarction Receiving Medication at Discharge				Discontinue Antibiotic Use for Surgical Infection Prophylaxis within 24 hr after Surgery End Time
	ACE Inhibitors or ARBs	β-Blockers	Aspirin	Lipid-Lowering Therapy	
Staffed beds					
<50	56.4	48.2	50.0	30.0	53.6
50–99	80.5	78.0	80.5	59.8	82.9
100–199	84.0	84.0	80.0	50.7	80.0
200–299	84.6	82.7	82.7	65.4	89.4
300–399	86.7	85.3	85.3	73.3	85.3
≥400	88.2	88.2	88.2	75.3	85.9
All hospitals—2007	75.1[b]	71.7[c]	71.8[d]	51.1[e]	74.0[f]
Pharmacist participation in program					
All hospitals—2007	32.4	29.3	30.5	28.2	72.1

[a]Of those hospitals with a program. ACE = angiotensin-converting enzyme, ARB = angiotensin-receptor blocker.
[b]Uncorrected $\chi^2 = 49.2624$, $df = 5$, design-based $F(4.07, 2136.03) = 11.8917$, $p < 0.0001$.
[c]Uncorrected $\chi^2 = 71.6372$, $df = 5$, design-based $F(4.07, 2136.28) = 17.2474$, $p < 0.0001$.
[d]Uncorrected $\chi^2 = 61.4406$, $df = 5$, design-based $F(4.07, 2137.31) = 14.8398$, $p < 0.0001$.
[e]Uncorrected $\chi^2 = 57.7681$, $df = 5$, design-based $F(4.09, 2148.06) = 13.6874$, $p < 0.0001$.
[f]Uncorrected $\chi^2 = 57.5464$, $df = 5$, design-based $F(4.07, 2136.90) = 13.9673$, $p < 0.0001$.

hospitals with fewer than 50 staffed beds.

Hospital characteristics. Table 1 shows the size, location, ownership, and affiliation status of the respondents' hospitals, the nonrespondents' hospitals, the surveyed hospitals, and the 4958 general and children's medical-surgical hospitals with pharmacies in the SMG hospital database. The characteristics of the surveyed hospitals are presented to highlight the complex sampling design used in this survey. Respondents and nonrespondents were statistically different in number of staffed beds and regional location. However, these differences are accounted for in the design-based analysis.

Formulary system management. Pharmacy directors indicated the extent of various formulary system management techniques used in their hospitals (Table 2). More than 80% of hospitals used a therapeutic interchange policy, took steps to minimize duplication of multisource products, and made efforts to minimize duplication of therapeutically equivalent products. More than 60% of hospitals used pharmacist interventions to help monitor prescriber compliance with established medication-use policies, regularly reviewed new therapeutic agents, and educated prescribers about medication costs. Approximately half regularly reviewed therapeutic categories and nonformulary medications. Approximately 30% of hospitals regularly evaluated prescriber adherence to medication-use policies and

Table 5.
Percentage of Hospitals with Medication-Use Evaluation Activities To Improve Prescribing (*n* = 411)[a]

Activity	% Hospitals Engaged in Activity by Year		
	2007	2004[3]	2001[6]
Tracking and assessing the trend of adverse drug events	98.3	98.3	99.4
Using retrospective drug-use evaluations	90.1[b]	88.6	93.6
Identifying problem-prone or high-risk therapies using preestablished criteria	75.8[c]	83.9	82.9
Complying with clinical practice guidelines	79.1	70.8	63.6
Routinely reviewing culture and sensitivity reports	83.6	81.5	75.4
Tracking and assessing the trend of pharmacist interventions	81.6[d]	84.5	83.6
Tracking and assessing the trend of treatment failures	25.0	34.6	27.8

[a]Of those hospitals with a medication-use evaluation program.
[b]Uncorrected $\chi^2 = 22.4091$, $df = 5$, design-based $F(4.02, 1626.23) = 4.9874$, $p = 0.0005$.
[c]Uncorrected $\chi^2 = 23.9128$, $df = 5$, design-based $F(4.05, 1641.76) = 5.1722$, $p = 0.0004$.
[d]Uncorrected $\chi^2 = 15.3121$, $df = 5$, design-based $F(4.08, 1652.71) = 3.2484$, $p = 0.0110$.

required prior approval for the use of nonformulary medications. Many of these formulary management techniques were significantly more common in larger hospitals than in smaller facilities. It is reasonable that larger hospitals are able to implement more formulary management techniques as these hospitals may have additional personnel available to participate in these management techniques.

The use of all but three formulary management techniques (using a therapeutic interchange policy, regularly reviewing nonformulary medications, and requiring prior approval for the use of nonformulary medications) has declined since 2001. The increased attention to nonformulary medications may be due to the recognition that when patients are admitted for a short hospital stay, it may not be in the best interest of patient care to switch medication regimens for patients already stabilized on long-term medication therapies. Given scarce resources and competing priorities, formulary management may have reached a level of maturity such that increased attention to these techniques may not occur in the future.

Clinical practice guidelines. Over 84% of all hospitals reported using clinical practice guidelines that included medications (Table 3). Furthermore, 93.2% of hospitals had pharmacists actively involved in the development and implementation of all evidence-based clinical practice guidelines that included medications. The use of clinical practice guidelines and pharmacist involvement in these guidelines has remained relatively stable since 2004[3] and has greatly increased since 2001.[6]

There were significant differences in the use of clinical practice guidelines by number of staffed beds. Over 90% of hospitals with 200 or more staffed beds used clinical practice guidelines that included medications, whereas only 77.3% of hospitals with fewer than 50 beds used clinical practice guidelines that included medications.

Joint Commission core measures. In an effort to increase appropriate treatment for common conditions, the Joint Commission developed core measures of compliance with nationally accepted clinical practice guidelines. We surveyed five core measures: four dealing with drug therapy in acute myocardial infarction (AMI) patients at discharge and the other being the discontinuation of prophylactic antibiotic use to prevent surgical infections. Nearly 75% of hospitals had programs to ensure that (1) patients hospitalized for AMI receive aspirin, β-blockers, and angiotensin-converting enzyme inhibitors or angiotensin-receptor blockers at discharge and (2) antibiotics used for surgical infection prophylaxis are discontinued within 24 hours after surgery end time (Table 4). Only about half of hospitals had programs to ensure that patients hospitalized for AMI receive lipid-lowering therapy at discharge. In all cases, larger hospitals were more likely to have these programs.

Pharmacists were most likely to participate in discontinuing antibiotics used for surgical infection prophylaxis within 24 hours after surgery end time (72.1%). Only about 30% of hospitals had pharmacists participate in programs about the core measures addressing drug therapy for AMI patients at discharge.

Improved prescribing through medication-use evaluation activities. A substantial majority of hospitals (72.0%) had a medication-use evaluation program designed to improve prescribing. The percentage of these medication-use evaluation programs differed as a function of number of staffed beds ($p < 0.0001$). For large hospitals, 90.6% of hospitals with 400 or more staffed beds, 88.0% of hospitals with 300–399 beds, and 89.4% of hospitals with 200–299 staffed beds had medication-use evaluation programs. Medication-use evaluation programs were present in 52.7% of hospitals with fewer than 50 beds, 72.0% of hospitals with

Table 6.
Percentage of Hospitals with Pharmacist Consultations

Type of Consultation	Consultation Provided			≥80% Adoption Rate of Pharmacist Recommendations		
	2001[6] (*n* = 528)	2004[3] (*n* = 492)	2007 (*n* = 521)	2001[6]	2004[3]	2007
Drug information	91.9	90.0	91.3	66.0	94.3	96.9
Dosage adjustments	88.1	92.6	92.5	72.7	93.3	97.3
Pharmacokinetics	76.9	82.9	87.2	85.3	95.4	99.5
Antibiotic	78.8	82.7	75.3	55.5	86.7	94.9
Nutrition support	46.7	51.1	48.4	76.9	91.6	98.4
Patient education	46.3	43.0	42.7	87.3	91.3	98.7
Pain management	38.0	37.8	34.8	65.9	91.6	98.6
Anticoagulation	33.8	41.7	40.4	73.2	87.3	99.7
Compliance and medical history	18.1	14.2	18.3	74.5	95.7	97.8

Table 7.
Mean Number of Pharmacist Consultations per Month

Type of Consultation	All Hospitals			Staffed Beds[a]					
	2001[6]	2004[3]	2007	<50	50–99	100–199	200–299	300–399	≥400
Drug information	50.6	77.4	92.8[b]	16.9	37.8	120.3	125.4	167.5	324.3
Dosage adjustments	49.3	96.8	104.7[c]	17.6	37.5	107.7	181.7	212.5	343.9
Pharmacokinetics	55.1	61.8	82.9[d]	9.0	36.1	83.6	127.5	145.5	322.1
Antibiotic	39.4	58.9	70.0[e]	10.2	28.6	41.6	134.9	124.7	278.1
Nutrition support	37.9	46.0	65.2[f]	3.8	15.9	59.4	92.3	113.1	247.1
Patient education	37.7	41.4	41.6[g]	14.8	22.4	46.5	41.0	53.0	125.5
Pain management	19.5	22.9	23.6[h]	7.2	9.0	12.2	23.2	43.5	110.0
Anticoagulation	97.5	90.6	84.2[i]	9.0	31.0	53.4	117.8	215.7	189.0
Compliance and medical history	42.4	35.2	76.1[j]	10.9	32.6	32.8	180.3	126.8	229.5

[a]Data for 2007.
[b]$F(1,410) = 11.50$, $p = 0.0008$.
[c]$F(1,420) = 42.69$, $p < 0.0001$.
[d]$F(1,396) = 58.50$, $p < 0.0001$.
[e]$F(1,343) = 39.91$, $p < 0.0001$.
[f]$F(1,216) = 22.84$, $p < 0.0001$.
[g]$F(1,197) = 16.42$, $p = 0.0001$.
[h]$F(1,153) = 17.83$, $p < 0.0001$.
[i]$F(1,196) = 46.06$, $p < 0.0001$.
[j]$F(1,81) = 39.60$, $p < 0.0001$.

50–99 beds, and 77.3% of hospitals with 100–199 beds. The prevalence of medication-use evaluation programs to improve prescribing has declined over the past six years.[3,6]

Pharmacy directors also reported the extent to which hospitals undertook a variety of medication-use evaluation activities to improve prescribing and the extent of pharmacist involvement in these activities (Table 5). More than 90% of hospitals tracked and monitored the trends for adverse drug events and performed retrospective drug-use evaluations. More than 80% of hospitals routinely reviewed culture and sensitivity reports and tracked and monitored trends for pharmacist interventions. More than 70% of hospitals reviewed compliance with clinical practice guidelines and identified problem-prone or high-risk therapies using preestablished criteria as a mechanism to improve prescribing. Less frequently undertaken was monitoring trends for treatment failures. Where differences in the percentage of hospitals that undertook an activity are noted, the smallest hospitals (those with less than 200 staffed beds) performed the activity least frequently.

The percentage of hospitals monitoring compliance with clinical practice guidelines as a medication-use evaluation activity to improve prescribing increased from 64% in 2001 to 79% in 2007. This increase suggests that organizations value improving prescribing using clinical practice guidelines and that the pharmacy department is playing a key role in this activity.

Pharmacist consultations. As in previous surveys, pharmacist consultations were defined as consisting of at least a review of patient medical records or clinical laboratory-determined serum drug concentrations and an oral or written follow-up with the prescriber. Pharmacy directors were asked to indicate which types of consulta-

tions were provided by pharmacists in their hospital, how many consultations occurred each month, and if most (80% or more) of the pharmacists' recommendations were adopted by prescribers. Pharmacists at more than 75% of hospitals provided consultations on dosage adjustments, drug information, pharmacokinetics, and antibiotics (Table 6). Pharmacists provided nutrition support consultations in approximately half of the hospitals and provided patient education and anticoagulation consultations in approximately 40% of hospitals. Consultations on pain management, compliance, and medical history were less frequently provided.

The mean number of monthly consultations varied from about 105 dosage adjustments to approximately 24 pain management consultations (Table 7). The mean number of consultations significantly increased with hospital size for all types of consultations. For each type of consultation examined, nearly all pharmacy directors indicated that 80% or more of the recommendations offered by pharmacists were adopted.

These results suggest that pharmacists are making a significant contribution to prescribing by providing consultations to prescribers. The percentage of hospitals providing different types of consultations has remained stable or increased slightly from previous surveys. The number of monthly consultations suggests that consultations are frequent events. The number of consultations provided has increased for nearly all consultation types, with the exception of anticoagulation management consultations. It is possible that the number of pharmacist-provided anticoagulation management consultations with patients at discharge decreased because patients' anticoagulation management is often provided in outpatient settings. We believe that the increased numbers of pharmacokinetics and nutrition

Table 8.
Percentage of Hospitals Using Various Methods for Providing Prescribers with Objective Drug Information

Method	All Hospitals			Staffed Beds[a]					
	2001[6] (*n* = 529)	2004[3] (*n* = 491)	2007 (*n* = 530)	<50 (*n* = 110)	50–99 (*n* = 82)	100–199 (*n* = 74)	200–299 (*n* = 104)	300–399 (*n* = 75)	≥400 (*n* = 85)
Staff pharmacists routinely answer questions	98.0	96.4	94.9[b]	89.1	100.0	95.9	97.1	97.3	98.8
Newsletters or bulletins	72.9	68.5	59.4[c]	41.8	51.2	66.2	78.8	76.0	80.0
Continuing-education programs	62.7	47.7	32.9[d]	20.9	30.5	32.4	41.3	50.7	55.3
Disseminating results of medication-use evaluation	64.3	63.9	48.4[e]	29.1	42.7	58.1	68.3	65.3	62.4
Electronic drug information product	48.1	60.4	67.6[f]	46.4	59.8	83.8	77.9	80.0	94.1
Formal drug information center	5.7	4.1	8.1[g]	4.5	6.1	8.1	5.8	9.3	28.2
Academic detailing	7.9	6.4	4.8[h]	0.9	3.7	5.4	6.7	8.0	14.1
Pharmacist attending rounds	30.4	35.3	34.4[i]	13.6	18.3	33.8	61.5	60.0	81.2

[a]Data for 2007.
[b]Uncorrected $\chi^2 = 19.3254$, $df = 5$, design-based $F(3.88, 2035.39) = 4.6969$, $p = 0.0010$.
[c]Uncorrected $\chi^2 = 50.2359$, $df = 5$, design-based $F(4.07, 2134.69) = 11.9868$, $p < 0.0001$.
[d]Uncorrected $\chi^2 = 29.9444$, $df = 5$, design-based $F(4.12, 2157.85) = 6.9675$, $p < 0.0001$.
[e]Uncorrected $\chi^2 = 50.5368$, $df = 5$, design-based $F(4.10, 2148.94) = 11.8926$, $p < 0.0001$.
[f]Uncorrected $\chi^2 = 72.6691$, $df = 5$, design-based $F(4.05, 2123.14) = 17.3760$, $p < 0.0001$.
[g]Uncorrected $\chi^2 = 28.3196$, $df = 5$, design-based $F(4.17, 2184.78) = 6.4620$, $p < 0.0001$.
[h]Uncorrected $\chi^2 = 16.1848$, $df = 5$, design-based $F(4.16, 2182.13) = 3.6066$, $p = 0.0055$.
[i]Uncorrected $\chi^2 = 120.7802$, $df = 5$, design-based $F(4.12, 2161.27) = 28.1368$, $p < 0.0001$.

support consultations are being incorporated into either specialty or general practice. With the transition to the entry-level doctor of pharmacy, pharmacists are increasingly ready to assume clinical roles, more so than previous graduates. Finally, when recommendations are given, there is nearly universal acceptance of the recommendations. This suggests that pharmacists are accepted members of the health care team whose input in patient care is valued by prescribers.

Drug information. Pharmacy directors were asked how their hospital provides objective drug information to prescribers. Having pharmacists routinely answer questions was the most frequently cited method by which objective drug information was provided to prescribers (94.9%), followed by the availability of an electronic drug information product (67.6%) and dissemination of newsletters or bulletins (59.4%) (Table 8). Approximately half of hospitals disseminated the results of medication-use evaluations (48.4%), and approximately one third of hospitals had pharmacists attend rounds (34.4%) and provide continuing-education programs (32.9%). Less frequently utilized mechanisms to provide objective drug information to prescribers included having a formal drug information center (8.1%) and academic detailing (4.8%). Larger hospitals were significantly more likely to use each of these methods to provide drug information to prescribers.

Table 9.
Percentage of Hospitals That Provide Electronic Drug Information and Internet Access

Electronic Source Availability	All Hospitals (*n* = 531)	Staffed Beds <50 (*n* = 110)	50–99 (*n* = 82)	100–199 (*n* = 75)	200–299 (*n* = 104)	300–399 (*n* = 75)	≥400 (*n* = 85)
None	6.9[a]	16.4	7.3	0	1.0	2.7	1.2
Pharmacy department only	11.8[a]	21.8	13.4	6.7	4.8	2.7	3.5
Hospital network only	81.2[a]	61.8	79.3	93.3	94.2	94.7	95.3
Internet access for pharmacists	97.6	97.3	95.1	100.0	97.1	98.7	96.5

[a]Uncorrected $\chi^2 = 76.7550$, $df = 10$, design-based $F(8.11, 4258.44) = 10.0328$, $p < 0.0001$.

Table 10.
Percentage of Hospitals Using Technology in the Prescribing and Transcribing Steps of the Medication-Use Process[a]

Characteristic	CPOE System with CDSS *n*	CPOE System with CDSS %	Components of EMR System *n*	Components of EMR System %	Complete EMR (No Patient Charts)[b] *n*	Complete EMR (No Patient Charts)[b] %	Pharmacists Use EMR To Manage Medication Therapy[b] *n*	Pharmacists Use EMR To Manage Medication Therapy[b] %
Staffed beds								
<50	110	7.3	110	24.5	27	3.7	27	66.7
50–99	82	12.2	82	40.2	33	21.2	33	84.8
100–199	75	6.7	75	50.7	38	7.9	38	92.1
200–299	104	10.6	104	50.0	52	9.6	52	88.5
300–399	75	13.3	75	53.3	40	5.0	40	82.5
≥400	85	25.9	85	55.3	47	8.5	47	93.6
All hospitals[c]								
2007	531	10.4[d]	531	41.0[e]	237	9.2	237	84.6[f]
2006[1]	460	8.7	460	38.1	. . .[g]	. . .	189	94.0
2005[2]	510	6.8	. . .	. . .	. . .	. . .	. . .	. . .
2004[3]	492	3.1	492	24.5	. . .	. . .	. . .	. . .
2003[4]	552	5.9	548	30.6	. . .	. . .	186	83.1

[a]CPOE = computerized prescriber order entry, CDSS = clinical decision-support system, EMR = electronic medical record.
[b]Of hospitals with an EMR system.
[c]Excludes federal facilities, Veterans Affairs hospitals, and specialty hospitals.
[d]Uncorrected $\chi^2 = 15.8055$, $df = 5$, design-based $F(4.13, 2168.99) = 3.6068$, $p = 0.0056$.
[e]Uncorrected $\chi^2 = 32.7003$, $df = 5$, design-based $F(4.11, 2157.90) = 7.6598$, $p < 0.0001$.
[f]Uncorrected $\chi^2 = 16.4623$, $df = 5$, design-based $F(4.17, 963.05) = 3.2716$, $p = 0.0101$.
[g]Data not collected.

Table 11.
Percentage of Hospitals Reporting Successful Approach to Medication Reconciliation with Pharmacy Involvement

Characteristic	*n*	%
Staffed beds		
<50	110	70.9
50–99	82	84.1
100–199	75	81.3
200–299	104	80.8
300–399	75	80.0
≥400	85	82.4
All hospitals		
2007	531	78.3
2006[1]	460	71.7
2005[2]	510	44.8

The standard method of having pharmacists routinely answer drug information questions has remained stable and high, and having pharmacists attend rounds has also been stable.[3,6] There was substantial increased use of electronic drug information products and associated declines in the use of traditional methods (newsletters, formal continuing-education programs, and dissemination of results of medication-use evaluations). These results follow a trend toward more electronic communication and ease of reference availability and away from more resource-intensive methods. Finally, formal drug information centers may be reemerging, matching levels not seen since 1998,[13] but more likely exist as drug policy centers that conduct drug policy analysis and formulary management rather than traditional centers that respond to prescribers' patient-specific drug information inquiries.

Electronic drug information resources were available on 81.2% of hospital networks, whereas 11.8% had electronic availability only in the pharmacy department, and 6.9% had no electronic sources of drug information (Table 9). Larger hospitals were significantly more likely to make electronic drug information resources available on the hospital network and less likely to have them

Table 12.
Primary Method by Which Pharmacy Receives Medication Orders[a]

Characteristic	*n*	% Hospitals			
		Handwritten Order (Copy or Original)	Electronically through CPOE	Fax	Digital Image Capture
Staffed beds					
<50	100	70.0	3.0	20.0	7.0
50–99	74	36.5	4.1	37.8	21.6
100–199	65	18.5	3.1	29.2	49.2
200–299	91	17.6	7.7	14.3	60.4
300–399	65	21.5	6.2	21.5	50.8
≥400	74	13.5	16.2	13.5	55.4
All hospitals	469	38.3	5.1	23.7	32.7

[a]CPOE = computerized prescriber order entry.

Table 13.
Off-site Medication Order Review and Entry Technology

Characteristic	Uses Off-site Medication Order Review and Entry Service After Hours		Provider of Off-site Medication Order Review and Entry Service			
	n	%	*n*	National or Regional Company (%)	Affiliated Hospital with 24-hr Pharmacy Services (%)	Other (%)
Staffed beds						
<50	107	15.0	16	18.8	50.0	31.3
50–99	75	30.7	23	34.8	52.2	13.0
100–199	49	26.5	13	53.8	23.1	23.1
200–299	30	30.0	9	22.2	66.7	11.1
300–399	11	27.3	3	33.3	66.7	0
≥400	5	20.0	1	100.0	0	0
All hospitals	277	22.0	65	34.0	44.8	21.2

available only in the pharmacy department or not have any electronic drug information resources at all. The Internet is widely available to hospital pharmacists, with 97.6% of hospitals providing pharmacists access to the Internet. The Internet is a widely diffused innovation in hospital pharmacies of all sizes, which allows pharmacists access to broader sources of information (e.g., national guideline clearinghouse) not available in the hospital.

Technologies. One technique used to improve prescribing and transcribing is the use of CPOE systems with clinical decision-support systems (CDSSs). CPOE systems work best when they are part of a comprehensive strategy to improve prescribing practices. Having decision-support systems integrated with CPOE is a key and necessary component to improve prescribing. Only 10.4% of hospitals had CPOE systems with CDSSs (Table 10). The largest hospitals utilized CPOE systems significantly more often than did smaller hospitals. Only 9.1% of hospitals with CPOE did not have their CPOE system integrated with their pharmacy computer system; these systems required manual reentry of orders into the pharmacy computer system by pharmacy staff. Interfaces decrease the opportunity for transcription errors. It is likely that the increases in interfaces were due to replacement of homegrown legacy systems with enterprise solutions that are naturally integrated and the movement away from a best-of-breed philosophy toward integrat-

Table 14.
Percentage of Hospitals Undertaking Actions To Ensure Accurate Transcription of Medication Orders[a]

Action	2007	2004[3]	2001[6]
Standard physician order forms used	88.8	90.2	89.6
Oral orders must be countersigned	71.4	78.5	83.0
All oral orders must be read back, including spelling the drug name, dose, dosage form, and name of patient	78.7	81.9	31.4
If CPOE not available, physicians must print or type all medication orders	4.2	3.8	3.9
Any illegible order is clarified before transcription or entry onto MARs	92.4	94.4	89.8
MARs and pharmacy patient profiles are reconciled at least daily	68.9	75.3	63.2
Have electronic MAR	37.4	. . .[b]	. . .
Pharmacy sends label to be placed on MAR	5.5	. . .	. . .
Second nurse double-checks written changes to MAR	31.4	. . .	. . .
Special transcribing procedures are used for high-risk drugs	18.4	21.9	17.3
Have CPOE with interface to pharmacy computer system	9.4	2.3	. . .

[a]CPOE = computerized prescriber order entry, MAR = medication administration record.
[b]Data not collected.

Table 15.
Policies on Injectable Medications Brought by the Patient for Administration by the Pharmacy[a]

Characteristic	*n*	% Hospitals with Policy	% Hospitals with Specific Policy: Accept Medication, Make the Preparation for Administration in Clinic	Require the Medication Be Sent Directly to the Pharmacy from a Licensed Identifiable Source	Refuse Unless It Is Purchased by Hospital Pharmacy	Handle on a Case-by-Case Basis	Never Had This Situation Arise
Staffed beds							
<50	40	15.0	2.5	15.0	15.0	35.0	32.5
50–99	34	32.4	11.8	11.8	5.9	44.1	26.5
100–199	34	38.2	0	26.5	20.6	29.4	23.5
200–299	48	50.0	8.3	25.0	18.8	33.3	14.6
300–399	47	44.7	4.3	23.4	21.3	31.9	19.1
≥400	55	50.9	9.1	23.6	20.0	38.2	9.1
All hospitals	258	35.1[b]	5.1	20.4	16.7	34.9	22.9

[a]Of hospitals with clinic operations.
[b]Uncorrected $\chi^2 = 20.3824$, $df = 5$, design-based $F(4.19, 1056.03) = 3.9947$, $p = 0.0027$.

ed enterprise medication-use system solutions. The adoption of CPOE is still in the early adoptor phase[14] but appears to be slowly growing.

Another technology used for information management and to improve prescribing is an electronic medical record (EMR). Overall, 41% of hospitals had one or more components of the medical record (e.g., medication administration record [MAR], clinical documentation, vital signs, CPOE, laboratory or radiology results, progress notes) in electronic form (Table 10). This varied by hospital size, with larger hospitals being more likely to have components of an EMR. For example, 55.3% of hospitals with 400 or more staffed beds had components of an EMR, while only 24.5% of hospitals with fewer than 50 staffed beds had components of the EMR. There is steady growth in the adoption of components of an EMR in hospitals, and this shows progress toward paper-free systems in the future. However, only 9.2% of hospitals with components of an EMR had a complete EMR system and did not use patient charts. Overall, 84.6% of hospitals provided pharmacists access to medication-relevant portions of the EMR for the purpose of managing medication therapy. This varied by hospital size, with pharmacists in larger hospitals being more likely to manage medication therapy using relevant portions of the EMR.

Medication reconciliation. After identifying problems with medication regimen continuity when patients were transferred between settings, the Joint Commission created the national patient safety goal on medication reconciliation to stimulate complete and accurate medication reconciliation across the continuum of care.[15] Hospitals were charged with developing a process for obtaining and documenting a complete list of patients' current medications at admission, when transferred within the organization, and at discharge. This process bridges both prescribing and transcribing components of the medication-use process.

Approximately 78% of hospital pharmacy directors reported that their hospital had developed and implemented, with the involvement of the pharmacy department, a successful approach to meeting the Joint Commission's national patient safety goal on medication reconciliation (Table 11). Compared with 2005, when only 45% reported having met the goal,[2] the percentage of hospitals conducting medication reconciliation activities has rapidly increased. The increases in pharmacist-provided consultations on patient compliance and medical histories (Table 7) are likely related to increased adoption of medication reconciliation processes.

Frequently, smaller hospitals have challenges in meeting certain standards of care; however, hospitals of all sizes have had similar success in

Table 16.
Pharmacy Total Acquisition Cost of Pharmaceuticals in Prior Fiscal Year

Characteristic	Mean ± S.E. Cost (Median) ($)	
	Inpatient[a]	Outpatient[b]
Staffed beds		
<50	835,676 ± 155,886 (481,000) (*n* = 73)	833,734 ± 256,982 (310,000) (*n* = 29)
50–99	1,601,287 ± 150,904 (1,200,000) (*n* = 65)	1,201,665 ± 240,890 (750,000) (*n* = 32)
100–199	4,532,289 ± 794,033 (3,000,000) (*n* = 57)	2,882,885 ± 802,863 (1,150,000) (*n* = 24)
200–299	6,422,543 ± 322,790 (6,008,376) (*n* = 91)	4,981,218 ± 1,701,796 (2,285,643) (*n* = 48)
300–399	9,219,828 ± 561,664 (8,131,004) (*n* = 66)	4,741,709 ± 795,633 (2,772,126) (*n* = 45)
≥400	16,722,533 ± 1,223,657 (14,550,000) (*n* = 79)	9,383,220 ± 1,570,474 (4,110,806) (*n* = 58)
All hospitals		
2007	4,955,941[c] ± 230,759 (*n* = 431)	3,682,685[d] ± 402,024 (*n* = 236)
2006[1]	4,897,533 ± 224,484 (*n* = 417)	. . .[e]
2005[2]	5,225,972 ± 227,695 (*n* = 461)	. . .
2004[3]	4,654,746 ± 181,331 (*n* = 450)	. . .
2003[4]	4,308,021 ± 98,601 (*n* = 499)	. . .
2002[5]	3,848,311 ± 140,959 (*n* = 446)	. . .

[a]Total acquisition cost for all pharmaceuticals, including drug products derived from blood and diagnostic agents but excluding i.v. fluids and i.v. infusion sets.
[b]Total acquisition cost for all pharmaceuticals, including drug products dispensed from an outpatient dispensing pharmacy and other ambulatory care settings (e.g., oncology clinics, ambulatory surgery centers).
[c]Design-based $F(1,425) = 32.13$, $p < 0.0001$.
[d]Design-based $F(1,230) = 10.73$, $p = 0.0012$.
[e]Data not collected.

Table 17.
Inpatient Pharmacy Staffing in Prior Fiscal Year[a]

		Mean ± S.E.			Mean ± S.E.		
Characteristic	***n***	**FTE Pharmacists**	**FTE Pharmacists per 100 Occupied Beds**	**% Vacant FTE Pharmacist Positions[b]**	**FTE Pharmacy Technicians**	**FTE Technicians per 100 Occupied Beds**	**% Vacant FTE Technician Positions[b]**
Staffed beds							
<50	107	1.9 ± 0.3	19.8 ± 1.8	7.7	2.0 ± 0.3	19.0 ± 2.0	1.7
50–99	82	4.1 ± 0.3	12.0 ± 1.1	9.7	4.3 ± 0.2	13.8 ± 1.6	3.5
100–199	75	9.1 ± 0.7	9.8 ± 0.6	6.2	8.7 ± 0.7	9.6 ± 0.6	4.2
200–299	103	15.0 ± 0.7	9.9 ± 0.4	5.4	14.3 ± 0.7	9.5 ± 0.4	3.5
300–399	74	19.9 ± 1.0	8.5 ± 0.4	6.5	18.6 ± 1.0	7.9 ± 0.3	4.5
≥400	84	39.7 ± 2.2	9.7 ± 0.5	6.3	34.5 ± 2.0	8.5 ± 0.5	4.9
All hospitals	525	10.2[c] ± 0.3	13.2[d] ± 0.6	6.4	9.5[e] ± 0.3	13.0[f] ± 0.7	4.1

[a]FTE = full-time equivalent.
[b]Calculated as number of vacant FTE positions/total FTE positions.
[c]Design-based $F(1,519) = 201.47$, $p < 0.0001$.
[d]Design-based $F(1,495) = 37.67$, $p < 0.0001$.
[e]Design-based $F(1,518) = 189.63$, $p < 0.0001$.
[f]Design-based $F(1,494) = 22.48$, $p < 0.0001$.

meeting the medication reconciliation requirements. The Joint Commission's standards appear to have narrowed the gaps between larger and smaller hospitals.

Transcribing. The traditional way for the pharmacy department to receive medication orders was by receiving a copy of the order or the original order itself. A copy of the original handwritten order was still the most common way for hospital pharmacy departments to receive medication orders (38.3%) in 2007 (Table 12). A copy was received by 37.3% of hospital pharmacy departments, and the original was received by only 1.0%. If a manual order system is used, the original order would be preferred because of concerns about carbon copies being difficult to read; however, the receipt of the original order is not a common practice. Digital image capture was used by 32.7% of hospitals, followed by fax (23.7%) and electronic receipt through CPOE (5.1%). Larger hospitals were more likely to use technology to deliver medication orders to the pharmacy department.

Off-site medication order review and entry technology has increased nurses' access to pharmacists when the pharmacy department is closed. Overall, 22.0% of hospitals used off-site medication order review and entry after hours (Table 13). Most commonly, hospitals used an affiliated hospital having 24-hour pharmacy services (44.8%), followed by a national or regional company (34%) and other methods (21.2%) (typically oncall pharmacists).

A majority of hospitals took one or more of five actions to ensure accurate transcription of medication orders: (1) clarification of illegible orders before transcription or entry into MARs, (2) use of standardized prescriber order forms, (3) requiring all oral orders to be read back (including spelling the drug name, dose, dosage form, and name of the patient), (4) requiring prescribers to

Table 18.
Pharmacy Full-Time Equivalents (FTEs) per 100 Occupied Beds by Type of Position[a]

Characteristic	*n*	Mean FTEs per 100 Occupied Beds				
		Management Pharmacists	Clinical Pharmacists	Distributive Pharmacists	Integrated Pharmacists	Informatics Pharmacists
Staffed beds						
<50	100	5.05	0.81	3.42	9.81	0.36
50–99	73	2.74	1.41	2.68	4.69	0.27
100–199	73	1.39	1.15	3.53	3.23	0.19
200–299	100	1.18	1.23	3.52	3.38	0.24
300–399	72	1.00	1.11	2.50	3.28	0.21
≥400	83	1.03	1.77	3.22	2.67	0.22
All hospitals	501	2.66[b]	1.14	3.26	5.51[c]	0.26

[a]Standard errors are available upon request from the authors.
[b]Design-based $F(1,495) = 5.50$, $p = 0.0195$.
[c]Design-based $F(1,495) = 15.68$, $p = 0.0001$.
[d]Design-based $F(1,495) = 8.46$, $p = 0.0038$.
[e]Design-based $F(1,495) = 44.40$, $p < 0.0001$.
[f]Design-based $F(1,495) = 37.67$, $p < 0.0001$.
[g]Design-based $F(1,494) = 22.48$, $p < 0.0001$.
[h]Design-based $F(1,519) = 23.76$, $p < 0.0001$.

countersign all oral orders, and (5) reconciliation of MARs and pharmacy patient profiles at least daily (Table 14). Actions taken less frequently included having an electronic MAR, having a second nurse double-check written changes to the MAR, using special transcribing procedures for high-risk medications, having CPOE with an interface to the pharmacy computer system, pharmacy sending a printed label to be placed on the MAR when changes are made to the MAR, and requiring prescribers to print or type all medication orders when CPOE is not available. Compared with 2001, the percentage of hospitals requiring all oral orders to be read back (including spelling the drug name, dose, dosage form, and name of the patient) increased from 31.4% to nearly 80%.[6] There were also decreases in countersigning oral orders since 2001. The Joint Commission's efforts to eliminate oral orders and the increased use of reading back oral orders suggest that the culture of safety surrounding oral orders has improved dramatically. These results continue to suggest that pharmacy is taking precautions to ensure accurate transcription of medication orders.

Clinic injectables. A growing number of health plans are requiring patients to obtain injectable medications from specialty pharmacies, with the expectation that patients will bring those medications to health-system clinics for administration. Health systems have concerns about the integrity of the drug supply, liability associated with administering medications that have exited the controlled supply chain, and proper storage of these medications.

One third of hospitals with clinic operations have a policy about medication preparations brought to the clinic by the patient for administration in the clinic. The presence of such a policy varied by hospital size, with larger hospitals being more likely to have a policy than smaller hospitals. Most commonly, health systems handled this issue on a case-by-case basis (34.9%), followed by never having had this situation arise (22.9%), requiring the medication be sent directly to the pharmacy from a licensed source (20.4%), refusing to administer preparations brought to the clinic by the patient (16.7%), and accepting the medication and administering it to the patient (5.1%) (Table 15).

It is encouraging that only 5.1% of hospitals and health systems accepted medications from patients for administration in the clinic. However, handling this issue on a case-by-case basis is concerning, as it does not suggest a clear policy direction for the organization and administration of preparations brought to the clinic by patients is likely. Ideally, clinics should require that medications be delivered directly from a licensed source to the clinic pharmacy. Refusing to administer medications that do not originate within the clinic's supply chain may result in treatment delays or other inconveniences to the patient. Policies are a first step in dealing with a difficult situation such as this, and hospitals should think broadly about how to best serve their patients while maintaining the integrity of the drug supply and ensuring patient safety.

Pharmacy operations. *Hours of operation.* Inpatient pharmacy services are provided for a mean ± S.E. of 103.8 ± 1.4 hours per week (Monday through Sunday), with smaller hospitals and health systems providing services significantly fewer hours a week compared with larger ones. Hospitals with fewer than 50 staffed beds were open a mean ± S.E. of 52.3 ± 2.3 hours per week, compared with 86.2 ± 3.3 hours for hospitals with 50–99 staffed beds, 121.6 ± 4.5 hours

Mean FTEs per 100 Occupied Beds					
Medication-Use Safety Coordinator Pharmacists	Other Pharmacists	Residents	Total Pharmacists	Total Pharmacy Technicians	Total Other Support Staff
0.20	0.17	0.00	19.8	19.0	0.93
0.14	0.03	0.00	12.0	13.8	0.82
0.10	0.13	0.09	9.8	9.6	1.93
0.08	0.09	0.16	9.9	9.5	1.07
0.08	0.09	0.26	8.5	7.9	0.81
0.09	0.19	0.54	9.7	8.5	0.78
0.13[d]	0.13	0.11[e]	13.2[f]	13.0[g]	1.05[h]

for hospitals with 100–199 beds, 151.1 ± 2.6 hours for hospitals with 200–299 beds, 158.1 ± 2.6 hours for hospitals with 300–399 staffed beds, and 163.9 ± 1.9 hours for hospitals with 400 or more staffed beds ($p < 0.0001$).

Overall, 34.0% of hospitals provided 24-hour inpatient pharmacy services. This varied significantly by staffed bed size: the larger the hospital, the higher percentage providing 24-hour inpatient pharmacy services. For example, 1.9% of hospitals with fewer than 50 staffed beds provided 24-hour inpatient pharmacy services, compared with 8.5% of hospitals with 50–99 beds, 35.6% of hospitals with 100–199 beds, 71.2% of hospitals with 200–299 beds, 85.3% of hospitals with 300–399 beds, and 95.2% of hospitals with 400 or more staffed beds ($p < 0.0001$). The percentage of hospitals providing 24-hour inpatient pharmacy services increased from 32.1% in 2006[1] and 30.2% in 2005.[2]

Product acquisition cost. Prior-year inpatient and outpatient pharmacy acquisition costs of pharmaceuticals varied significantly by hospital size (Table 16). Inpatient pharmaceutical acquisition costs included all drug products derived from blood and diagnostic agents but excluded i.v. fluids and infusion sets. Outpatient pharmaceutical acquisition costs included drug products dispensed from an outpatient pharmacy and other ambulatory care settings (e.g., oncology clinics, outpatient surgery centers). Larger hospitals had higher inpatient and outpatient expenditures.

Staffing. The number of full-time-equivalent (FTE) pharmacists (i.e., 40 hours per week) averaged 10.2 and varied significantly by hospital size (Table 17). The larger the hospital, the greater the number of FTE pharmacists. The number of FTE technicians averaged 9.5 and varied significantly by hospital size. As with pharmacists, the larger the hospital, the greater the number of FTE technicians.

The number of FTE pharmacists per 100 occupied beds (average daily census) averaged 13.2 across all hospitals (Table 17). In addition, the number of FTE technicians per 100 occupied beds averaged 13.0 across all hospitals. This varied significantly by hospital size, with the smallest hospitals having the most FTE pharmacists and FTE technicians per 100 occupied beds.

Overall, it is estimated that 6.4% of FTE pharmacist positions and 4.1% of FTE pharmacy technician positions are vacant nationally (Table 17). The percentage of vacant FTE positions was calculated by dividing the number of vacant FTE positions by the total number of FTE positions within each category of bed size and overall.

The average number of FTEs per 100 occupied beds for management, clinical, distributive, integrated, informatics, medication-use safety, and other pharmacists by number of staffed beds is provided in Table 18. In addition, the FTEs per 100 occupied beds for residents, technicians, interns, and support staff are provided.

To compare a hospital's staffing levels to the national average, find the average number of FTEs per 100 occupied beds in the category of staffed beds that matches the institution, multiply that number by the number of occupied beds in the hospital (average daily census), and divide by 100. The allocation of FTEs across different types of pharmacist and nonpharmacist staff varied greatly by hospital size and clinical versus distributive pharmacist designations, or integrated pharmacists that spend approximately equal amounts of time in clinical and distributive activities.

Table 19.
Inpatient Pharmacy Staff Turnover in Prior Fiscal Year[a]

Characteristic	*n*	FTE Pharmacist Turnover, Mean ± S.E.	% Pharmacist Turnover[b]	FTE Pharmacy Technician Turnover, Mean ± S.E.	% Pharmacy Technician Turnover[b]
Staffed beds					
<50	108	0.3 ± 0.1	13.4	0.2 ± 0.0	9.2
50–99	82	0.4 ± 0.1	9.1	0.6 ± 0.1	13.8
100–199	75	0.7 ± 0.1	7.4	1.3 ± 0.2	14.2
200–299	102	1.0 ± 0.1	7.0	1.8 ± 0.2	12.7
300–399	74	1.3 ± 0.1	6.7	2.5 ± 0.2	13.4
≥400	83	2.8 ± 0.3	7.2	5.0 ± 0.4	14.7
All hospitals	524	0.8[c] ± 0.1	7.7	1.3[d] ± 0.1	13.6

[a]FTE = full-time equivalent.
[b]Calculated as number of FTE resignations/total FTE positions.
[c]Design-based $F(1,518) = 169.65$, $p < 0.0001$.
[d]Design-based $F(1,518) = 216.19$, $p < 0.0001$.

Turnover. Inpatient pharmacy staff turnover is presented in Table 19. Larger hospitals experienced higher pharmacist and pharmacy technician staff turnover. The overall rate of turnover was 7.7% for pharmacists and 13.6% for pharmacy technicians.

Work from home. Technology allows for increased flexibility in location of work. Overall, 7.4% of hospitals had pharmacists processing patient care orders from home, and 5.1% of hospitals had other pharmacy department employees working from home (e.g., billing, special projects). As advances in technology enable managers to use this option, this trend should continue to be monitored.

Limitations. Caution should be exercised in interpreting these figures. Not all hospitals are the same. While these figures provide averages, each hospital offers unique products and services that may not fit within these benchmarks.

Summary

For more than a decade, it has been recognized that adverse drug events are the result of errors at all steps in the medication-use process, including prescribing and transcribing.[16]

Several interesting trends have emerged in comparing data from the three cycles of the ASHP national hospital pharmacy survey that focus on prescribing and transcribing. There has been a gradual decline in the use of the formulary system, which had been a mainstay in "evaluating and selecting suitable drug products"[17] for many years. This decline is likely a result of the emergence of outpatient formularies. It is probably unwise to change therapies for patients receiving long-term therapy during a short hospital stay simply to adhere to the hospital's formulary. This is not the only reason that the formulary system is being challenged as a way to improve prescribing.

Another trend is the increase in the use of clinical practice guidelines that not only provide evidence-based specification for the selection of specific drugs but also other care variables that are important for the treatment of the patient, including indications, doses, and monitoring criteria. It could be argued that clinical practice guidelines are a more comprehensive way to improve prescribing than the formulary system and represent a logical evolution in quality-improvement strategies.

The use of medication-use evaluation programs to detect opportunities to improve prescribing has also declined. This may be explained by the growth of more concurrent methods to improve prescribing, such as pharmacist-provided drug information, pharmacist consultations with prescribers, and the continued gradual increase in CPOE systems with decision support. It could be argued that concurrent systems to improve prescribing are preferred over retrospective approaches, where poor practices have had the potential to harm patients.

The most rapid changes in practices are often prompted by accreditation standards. This was demonstrated by the increases in safe practices for medication reconciliation and reading back oral orders to improve prescribing and transcribing. In addition to increasing the adoption rate of these safe-medication practices, accreditation standards have also increased the extent to which they are adopted in smaller hospitals. This is important in realizing a future where safe medication practices do not vary by hospital size.

Conclusion

The 2007 ASHP survey results indicate that pharmacists are responding to changes in the health care system to find appropriate ways to improve medication use at the pre-

scribing and transcribing steps of the medication-use system.

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