ASHP national survey of pharmacy practice in hospital settings: Prescribing and transcribing—2001

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Abstract: Results of the 2001 ASHP national survey of pharmacy practice in hospital settings that pertain to prescribing and transcribing are presented.

A stratified random sample of pharmacy directors at 1091 general and children's medical–surgical hospitals in the United States was surveyed by mail. SMG Marketing Group, Inc., supplied data on hospital characteristics; the survey sample was drawn from SMG's hospital database.

The response rate was 49.0%. During 2001, nearly all hospitals are estimated to have pharmacy and therapeutics (P&T) committees that meet an average of seven times per year. It is estimated that more than 90% of P&T committees are responsible for formulary development and management, drug policy development, adverse-drug-reaction review, and medication-use evaluation. More than 90% of hospitals use clinical and therapeutic, cost, and pharmacoeconomic information in the formulary management process, while nearly two thirds consider quality-of-life issues. Nearly 70% use clinical practice guidelines in the formulary management process, and 78% have a medication-use evaluation program designed to improve prescribing. Pharmacists in more than 75% of hospitals provide consultations on drug information, dosage adjustments for patients with renal impairment, antimicrobials, and pharmacokinetics. Further, a majority of hospitals ensure accurate transcription of medication orders by clarifying illegible orders before transcription or entry into medication administration records (MARs), using standardized prescriber order forms, requiring prescribers to countersign all oral orders, and reconciling MARs and pharmacy patient profiles at least daily. In 2001, large hospitals are most likely to use prescriber order-entry systems to improve patient safety and are least likely to require the reentry of medication orders into the pharmacy computer system.

The 2001 ASHP survey results suggest that pharmacists in hospital settings have positioned themselves well to improve the prescribing and transcribing components of the medication-use process.

Index terms: Administration; American Society of Health-System Pharmacists; Computers; Data collection; Drug use; Drugs, adverse reactions; Errors, medication; Formularies; Pharmaceutical care; Pharmaceutical services; Pharmacists, hospital; Pharmacy and therapeutics committee; Pharmacy, institutional, hospital; Physicians; Prescribing

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The ASHP national survey of pharmacy practice in hospitals focuses on the role pharmacists play in managing and improving the medication-use process. It is organized in accordance with six steps in the medication-use process: prescribing, transcribing, dispensing, administration, monitoring, and patient education and wellness. ASHP's hospital survey was redesigned on the basis of this construct into a three-part series beginning in 1998 and concluding in 2000. Therefore, the cycle repeats every three years. The 2001 survey represents the first part in this cycle and is concerned with prescribing and transcribing practices. When combined, the 2001–2003 surveys will represent a composite picture of the current role of pharmacists in managing and improving the medication-use process.

In assessing the role of pharmacists in prescribing and transcribing, the present study sought to describe the activities of the pharmacy and therapeutics (P&T) committee, the process of formulary-system management,

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the use of clinical practice guidelines, medication-use evaluation activities, the use of trend data to improve prescribing, the extent of pharmacist consultations, the provision of drug information to prescribers, the evaluation of medication orders, the use of prescriber order-entry systems, and actions taken to ensure accurate transcription of medication orders.

Methods

Assessing the extent to which pharmacists are involved in the prescribing and transcribing aspects of the medication-use process in hospitals required attention to three important factors. First, it was necessary to develop a method that would maximize the number of completed questionnaires. A relatively high response rate reduces the likelihood of nonresponse bias in the results. Second, any survey runs the risk of producing biased results if the questions are not simple and unambiguous. For this reason, it was important to design clear questions and answers, present them in a simple format, and have them follow a logical sequence. Third, both response rate and response accuracy improve as questionnaire length declines. Thus, it was necessary to ensure that the survey could be completed in a reasonable amount of time and with reasonable effort.

Questionnaire development. The 1998 questionnaire served as a template for the final survey instrument used in 2001. Each question from the 1998 questionnaire was evaluated for clarity, response, and nonduplication in the three parts (1998–2000) of the survey. Questions with poor response rates were modified or deleted, and duplicate items were removed. A few question domains were added or expanded where appropriate, such as questions about prescriber order-entry systems.

The 2001 questionnaire was developed and pretested by using procedures suggested by Dillman.[1] Drafts were pretested in March 2001 with pharmacy administrators who serve on ASHP councils and advisory groups and ASHP staff members. As with past surveys, data on hospital characteristics (i.e., number of licensed beds, number of occupied beds, U.S. Bureau of Census region, ownership, U.S. Bureau of Census metropolitan statistical area [MSA] status,[2] and medical school affiliation status) were available in the SMG Marketing Group, Inc., 2000 hospital database.[3]

Survey sample. ASHP purchased the SMG hospital database in January 2001. This database is unique in that it provides information about pharmacy directors and hospital characteristics. To build this database, SMG surveys all state health departments, state health planning agencies, and health insurance commissions responsible for monitoring health care delivery and planning. SMG also obtains data submitted to the federal Health Care Financing Administration (now known as the Centers for Medicare & Medicaid Services). In many cases, individual hospitals are contacted directly through SMG's mail and telephone surveys. In addition, multihospital organizations and group purchasing organizations provide information on their market segments, including profiles of health systems and lists of individual members. Data for the calendar year are then collected from all hospitals in the United States. SMG compares this information with historical data to assess accuracy.

From the database of 6885 hospitals, a sampling frame of 5264 general and children's medical–surgical hospitals in the United States was constructed. Past ASHP national surveys selected a random sample of the hospitals from the sampling frame. Because the number of very large hospitals is much fewer than the number of smaller hospitals, this led to low numbers of respondents from large hospitals. Frequently, less than 30 hospitals were represented in the estimates for the largest hospitals. Therefore, the accuracy of estimates was uncertain.

To correct this problem, hospitals were stratified by size before sampling, and random samples of 200 hospitals within these strata were taken to construct the sample of 1200 hospitals. This sampling method was employed to provide better estimates for all general and children's medical–surgical hospitals in the United States.

In March 2001, each of the 1200 hospitals was called (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 name of the director of pharmacy, the adjusted sample comprised 1091 hospitals.

Data collection. Pharmacy directors in the sample were contacted up to five times during the survey period. Unlike past surveys, an announcement letter was not sent to the sample. The first contact occurred with a survey packet mailed on March 28, 2001. One week after the initial survey mailing, reminder postcards were mailed. During the fourth week of April 2001, the surveys were mailed a second time to the 847 nonrespondents. The survey was sent a third time by Federal Express to the 716 remaining nonrespondents on May 24, 2001. Reliance Teleservice made a final telephone contact with nonrespondents from May 30 through June 1, 2001.

Research has shown that incentives enclosed with the request to complete the questionnaire outperform the promise to send a larger incentive after a completed questionnaire is received.[4] Therefore, to increase response rate, all members of the sample were sent a $25 ASHP gift certificate for membership services or publications as an incentive with the first survey packet.

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.

Reporting by respondent characteristics was changed in the present survey to more accurately present usable data for hospital administrators, staff, and policymakers. In past surveys, respondent characteristics were reported by licensed beds, occupied beds, region, ownership status, MSA status, and medical school affiliation. The terminology for bed size of the hospital was examined. Past surveys have presented data by the number of occupied beds. To more closely align with data presented by the American Hospital Association,[5] data are presented in this report by categories of staffed beds. This matches the terminology of licensed beds used in previous surveys. To streamline the presentation of data, we also eliminated the reporting of data by region, ownership status, MSA status, and medical school affiliation. These characteristics did not seem meaningful as a sole criterion for comparison.

Because of the stratified random sampling procedure, it was necessary to employ a design-based analysis. This method of sampling was used to ensure that our sample was representative of the entire population. A design-based analysis produces population estimates that are much more accurate. Additionally, it improves the reliability of population estimates and is convenient when separate estimates are desired for population parameters in each subdomain (e.g., hospital size). An excellent review of stratified sampling methodology and design-based analysis can be found in Levy and Lemeshow's text.[6]

Data were entered using SPSS, version 10.0.7 (SPSS Inc., Chicago, IL). Data were converted to a Stata, version 6 (Stata Corporation, College Station, TX), readable format using DBMS/COPY, version 7 (Conceptual Software, Inc., Houston, TX). All nondesign-based analyses were conducted using SPSS 10. All design-based analyses were conducted with Stata 6 using the set of survey commands. Respondents were assigned weights to account for their contribution to the population estimate. Weights were assigned according to the relation of the number of respondents to the number of hospitals in the population. The weight was 18.23 for hospitals with fewer than 50 staffed beds, 11.35 for hospitals with 50–99 beds, 12.90 for hospitals with 100–199 beds, 8.29 for hospitals with 200–299 beds, 4.51 for hospitals with 300–399 beds, and 5.42 for hospitals with 400 staffed beds or more. Because the largest hospitals were oversampled, their contribution was less to the population estimate than the responses from the smallest hospitals that were undersampled. The strata were the categories for the number of staffed beds, and the finite population correction was the total number of hospitals in the population (5264).

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

During the response period, which lasted 13 weeks from March 28 through June 29, 2001, 535 surveys were returned for a response rate of 49.0%. This response rate is substantially higher than that of most mail questionnaires received.[7]

The response rates for the 1998, 1999, 2000, and 2001 surveys (51.8%, 51.3%, 50.2%, and 49.0%, respectively)[8-10] were substantially higher than the response rates for the 1996 and 1994 surveys (37.1% and 43.9%, respectively).[11,12] The most likely explanation for the higher response rates is the reduced number of questions on the surveys administered between 1998 and 2001. Each survey focused on only two of the six steps involved in the medication-use process. Possible explanations for the slight decrease in response rates this year include the absence of an announcement letter and the inclusion of hospitals contacted in the previous cycle in the current survey sample.

Hospital and pharmacy characteristics. Table 1 shows the size, location, ownership, and affiliation status of the respondents' hospitals, the nonrespondents' hospitals, the surveyed hospitals, and the 5264 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 employed in this survey. The distribution of hospital size (i.e., number of occupied beds), region of the country, MSA status, and medical school affiliation for respondents was not statistically different from that of nonrespondents and was quite similar to those hospitals sampled. Relative to those of nonrespondents and the surveyed hospitals, for-profit institutions were somewhat underrepresented, as were hospitals with fewer than 50 staffed beds. As a design-based analysis is employed, these slight differences have been adjusted for in the population parameter estimates.

The sampling design ensured approximately equal distribution of hospitals by the number of staffed beds. Nearly two thirds of the respondents' hospitals are in the South and the Midwest. Most are nonprofit organizations (92%), most are not affiliated with a medical school (65%), and most are located within an MSA (64%).

Several indicators of annual health-system and pharmacy activity are presented in Table 2. On average, the hospitals described in this article project an occupancy rate of approximately 52%. Occupancy rates differ significantly as a function of hospital size, with smaller institutions reporting lower occupancy rates than larger

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

Characteristic	Respondents		Nonrespondents		Surveyed		Population	
	n	%	*n*	%	*n*	%	*n*	%
All hospitals	535	49.0	556	51.0	1091	. . .	5264	. . .
Staffed beds[b]								
<50	66	12.3	101	18.2	167	15.3	1203	22.9
50–99	97	18.1	86	15.5	183	16.8	1101	20.9
100–199	104	19.4	77	13.8	181	16.6	1342	25.5
200–299	86	16.1	101	18.2	187	17.1	713	13.5
300–399	89	16.6	98	17.6	187	17.1	401	7.6
≥400	93	17.4	93	16.7	186	17.0	504	9.6
Occupied beds								
<50	161	30.2	184	33.2	345	31.7	2318	44.2
50–99	98	18.4	78	14.1	176	16.2	1107	21.1
100–199	139	26.1	139	25.0	278	25.6	1059	20.2
200–299	77	14.4	99	17.8	176	16.2	427	8.2
300–399	28	5.3	29	5.2	57	5.2	178	3.4
≥400	30	5.6	26	4.7	56	5.1	150	2.9
Region								
West	92	17.2	95	17.1	187	17.1	1016	19.3
Midwest	158	29.5	149	26.8	307	28.1	1510	28.7
South	187	35.0	209	37.6	396	36.3	1960	37.2
Northeast	98	18.3	103	18.5	201	18.4	778	14.8
MSA status								
Within an MSA	341	63.7	355	63.8	696	63.8	2933	55.7
Outside an MSA	194	36.3	201	36.2	395	36.2	2331	44.3
Ownership[c]								
For-profit	43	8.0	67	12.1	110	10.1	636	12.1
Nonprofit	492	92.0	489	87.9	981	89.9	4628	87.9
Medical school affiliation								
Yes	188	35.4	202	36.8	390	36.1	1411	27.2
No	343	64.6	347	63.2	690	63.9	3786	72.8

[a]From the SMG hospital database. MSA = metropolitan statistical area.
[b]$\chi^2 = 13.261$, d.f. = 5, $p < 0.021$.
[c]$\chi^2 = 4.843$, d.f. = 1, $p < 0.028$.

ones. The average length of stay reported for the hospitals in this study is about seven days and does not significantly differ as a function of hospital size.

Inpatient pharmaceutical services are provided approximately 98 hours per week (Monday through Sunday), with smaller hospitals providing services for significantly fewer hours a week than larger ones. Ambulatory care pharmaceutical services are provided for about 73 hours per week by 40% of the respondents, and smaller hospitals provide fewer hours per week of such services compared to larger ones.

P&T committee. Nearly all (99.3%) the hospitals reported having a P&T committee. P&T committees meet about seven times per year (Table 3). The number of meetings varied significantly based on hospital size: the larger the hospital size, the higher the number of P&T committee meetings per year ($p < 0.0001$). For example, hospitals with fewer than 50 beds meet an average of 6.2 times per year, while those with 400 beds or more meet an average of 8.88 times per year. These estimates corroborate findings from the 1998 survey.[8] Because the precise confidence intervals are relatively narrow and contain only one whole number, these data may provide helpful benchmark information to hospitals.

The vast majority of hospital P&T committees are responsible for formulary development and management (97.5%), drug policy development (97.1%), adverse-drug-reaction review (95.8%), and medication-use evaluation (91.3%). A majority of P&T committees are responsible for clinical practice guidelines (62.4%) and professional staff education regarding medication use (56.8%). P&T committees in larger hospitals are more likely to be involved in clinical practice guideline development and approval than smaller hospitals (uncorrected $\chi^2 = 10.68$, d.f. = 5, $p < 0.050$).

Formulary-system management. More than 90% of pharmacy directors reported using clinical and therapeutic, cost, and pharmacoeconomic information in their hospitals' formulary-system management process (99.4%, 98.7%, and 92.1%, respectively). Quality-of-life information is considered by nearly two thirds of hospital P&T committees in the formulary management process. These data confirm that formulary-system management is a complicated process that extends beyond cost, contracting, and therapeutic efficacy issues. It is not only based on pharmacoeconomic principles that incorporate measures of cost and outcomes, but also on humanistic dimensions of care.[13] The use of quality-of-life information in the formulary-system man-

Table 2.
Hospital and Pharmacy Activity Levels by Number of Staffed Beds

Activity Measure	*n*	Mean ± S.D.
Occupancy rate (%)[a]		
All hospitals	533	51.5 ± 19.2
<50	65	40.8 ± 20.6
50–99	97	46.7 ± 19.1
100–199	104	54.7 ± 16.6
200–299	85	58.0 ± 15.4
300–399	89	59.2 ± 15.4
≥400	93	63.7 ± 14.7
Length of stay (days)		
All hospitals	533	7.4 ± 9.0
<50	65	5.5 ± 4.4
50–99	97	10.3 ± 15.3
100–199	104	7.9 ± 8.7
200–299	85	6.1 ± 2.9
300–399	89	6.5 ± 5.2
≥400	93	6.4 ± 4.8
Weekly inpatient pharmacy hours of operation[b]		
All hospitals	526	97.9 ± 48.2
<50	64	55.3 ± 27.6
50–99	92	66.1 ± 23.9
100–199	104	100.5 ± 35.4
200–299	85	131.9 ± 38.0
300–399	88	152.1 ± 27.9
≥400	93	165.5 ± 11.4
Weekly ambulatory care pharmacy hours of operation[c]		
All hospitals	212	73.3 ± 39.4
<50	16	48.0 ± 13.4
50–99	21	58.0 ± 14.7
100–199	39	77.0 ± 29.8
200–299	34	94.8 ± 48.9
300–399	47	84.6 ± 53.6
≥400	55	75.4 ± 47.0

[a] $F(1,527) = 84.07$, $p < 0.0001$, analysis of variance (ANOVA).
[b] $F(1,520) = 1158.59$, $p < 0.0001$, ANOVA.
[c] $F(1,206) = 26.70$, $p < 0.0001$, ANOVA.

Table 3.
Frequency of Pharmacy and Therapeutics (P&T) Committee Meetings

Characteristic	*n*	Number of Annual P&T Committee Meetings, Mean ± S.E. (95% CI)[a]
All hospitals	520	7.02 ± 0.14 (6.74, 7.30)
Staffed beds[b]		
<50	66	6.20 ± 0.39 (5.44, 6.95)
50–99	90	6.20 ± 0.29 (5.62, 6.78)
100–199	101	7.25 ± 0.29 (6.67, 7.83)
200–299	84	7.23 ± 0.31 (6.63, 7.83)
300–399	87	8.24 ± 0.29 (7.67, 8.81)
≥400	92	8.88 ± 0.24 (8.41, 9.35)

[a] CI = confidence interval.
[b] $F(1,514) = 40.61$, $p < 0.0001$, analysis of variance.

agement process has increased since 1998.[8] Further adoption of these dimensions focusing on outcomes suggests that pharmacists are having a positive impact on the prescribing process.

Pharmacy directors indicated the extent of various formulary-system management techniques used in their hospitals (Table 4). More than 90% of hospitals minimize duplication of multisource products and therapeutically equivalent agents. More than three quarters use pharmacist interventions to help monitor prescriber compliance with established medication-use policies, educate prescribers about medication costs, adopt a therapeutic interchange policy, and regularly review new therapeutic agents. Nearly two thirds regularly review therapeutic categories, and almost half regularly review nonformulary medications. Approximately one third routinely evaluate prescriber adherence to medication-use policies, and more than one fourth require prior approval for use of nonformulary medications. Most of these formulary-system management techniques are significantly more common in larger hospitals than in smaller facilities.

Overall, 23.2% of hospitals monitor formulary compliance on the basis of the percentage of medication orders filled with formulary-approved drugs. Of these, 43.3% achieve 90% or greater compliance, 29.8% achieve between 80% and 89% compliance, 18.9% achieve between 70% and 79% compliance, and 8.0% achieve less than 70% compliance. However, hospitals with systems in place for monitoring formulary compliance achieve higher levels of compliance than those without such systems. For example, 68.8% of hospitals that track formulary compliance have 90% or better compliance, 24.4% have between 80% and 89% compliance, 11.9% have between 70% and 79% compliance, and 2.8% have less than 70% compliance. It is estimated that only 35.9% of hospitals that do not have such tracking systems achieve 90% or better compliance, 32.0% achieve between 80% and 89% compliance, 21.8% achieve between 70% and 79% compliance, and 10.2% achieve less than 70% compliance.

It is reasonable that larger hospitals are able to implement more formulary-system management techniques, since they need to col-

Table 4.
Percentage of Hospitals Using Various Formulary-System Management Techniques by Number of Staffed Beds

Technique	All Hospitals (*n* = 531)	Staffed Beds <50 (*n* = 66)	50–99 (*n* = 94)	100–199 (*n* = 104)	200–299 (*n* = 85)	300–399 (*n* = 89)	≥400 (*n* = 93)
Minimal duplication of multisource products	96.3	93.9	100.0	94.2	95.3	98.9	98.9
Minimal duplication of therapeutically equivalent products	90.7	92.4	88.2	89.4	89.4	93.3	94.6
Pharmacist interventions designed to help monitor prescriber compliance with established medication-use policies	89.0	81.8[a]	88.3	92.2	89.4	96.6	92.5
Education of prescribers regarding medication costs	84.5	77.3	83.9	86.5	85.7	88.8	92.5
Therapeutic interchange policy	83.5	75.8[b]	74.2	88.5	92.9	87.6	91.4
Regular review of new therapeutic agents	76.8	78.8[c]	67.0	71.2	82.4	85.4	93.5
Regular review of therapeutic categories	62.2	65.2[d]	47.9	58.7	65.9	73.0	80.6
Regular review of nonformulary drugs	48.2	47.0[e]	30.9	40.4	58.8	75.3	72.0
Regular evaluation of prescriber adherence to medication-use policies	37.5	24.6[f]	27.2	35.0	47.1	56.8	66.7
Prior approval required for nonformulary product use	26.2	27.7[g]	12.8	27.9	22.4	36.8	44.1

[a]Uncorrected $\chi^2 = 11.02$, d.f. = 5, $F(4.07,2132.34) = 2.51$, $p < 0.0391$.
[b]Uncorrected $\chi^2 = 21.94$, d.f. = 5, $F(4.06,2125.44) = 4.97$, $p < 0.0005$.
[c]Uncorrected $\chi^2 = 19.56$, d.f. = 5, $F(3.98,2090.15) = 4.39$, $p < 0.0016$.
[d]Uncorrected $\chi^2 = 20.51$, d.f. = 5, $F(4.02,2113.08) = 4.57$, $p < 0.0011$.
[e]Uncorrected $\chi^2 = 43.38$, d.f. = 5, $F(4.05,2125.50) = 9.67$, $p < 0.0001$.
[f]Uncorrected $\chi^2 = 41.69$, d.f. = 5, $F(4.05,2094.09) = 9.10$, $p < 0.0001$.
[g]Uncorrected $\chi^2 = 21.78$, d.f. = 5, $F(4.10,2142.74) = 4.80$, $p < 0.0007$.

laborate with a larger number of prescribers practicing at their institutions. Larger hospitals may also have additional personnel available to participate in these management techniques. Although it is important to monitor formulary compliance, the process may be more complicated than a simple dichotomous response. For example, in the case of a patient who is admitted to the hospital for a short period of time, it may not be in the best interest of the patient or the provider to change the patient's long-term medication regimen, on which he or she has been stabilized. Therefore, it may not always be reasonable to achieve greater than 90% compliance, which may explain why some pharmacy directors do not track formulary compliance.

Clinical practice guidelines. Nearly 70% of all hospitals reported using clinical practice guidelines established for specific illnesses, diagnoses, or procedures (Table 5). While 92.4% of hospitals have pharmacists involved in the development of these clinical practice guidelines, 80% have pharmacists implementing the guidelines, and 78.8% have pharmacists monitoring the use of the guidelines.

There are significant differences in the use of clinical practice guidelines on the basis of the number of staffed beds. Hospitals with more than 300 staffed beds are most likely to use clinical practice guidelines. Hospitals with more than 200 beds are most likely to involve pharmacists in developing the guidelines, while hospitals with fewer than 50 beds and those with more than 400 beds are most likely to involve pharmacists in implementing the guidelines and monitoring their use.

Overall, 71.3% of hospitals with clinical practice guidelines monitor prescriber adherence to the guidelines (Table 6). Hospital pharmacy directors were also asked to indicate the committee or department responsible for monitoring prescriber adherence to clinical practice guidelines. The quality assurance or quality improvement committee was most frequently cited (44.6%), followed by the P&T committee (26.2%) and the hospital staff peer-review committee (11.6%). The pharmacy department, risk management committee, and "other" categories were not routinely cited as having primary responsibility for monitoring prescriber adherence to the guidelines.

The decrease in the use of clinical practice guidelines from 1998[8] (76.3% versus 68.8%) may be explained by the overrepresentation of larger hospitals in the 1998 survey; larger hospitals are more likely to use clinical practice guidelines than smaller hospitals. Overall, the data reveal that pharmacists have become more involved in implementing clin-

Table 5.
Percentage of Hospitals with Clinical Practice Guidelines and Pharmacist Involvement by Selected Hospital Characteristics

Characteristic	*n*	% with Clinical Practice Guidelines	% with Pharmacists Actively Involved in Activity		
			Development	Implementation	Monitoring
All hospitals	520	68.8	92.4	80.0	78.8
Staffed beds					
<50	66	62.1[a]	87.8	90.2	90.2
50–99	90	53.2	92.0	74.0	82.0
100–199	101	72.1	91.6	72.6	69.0
200–299	84	72.9	95.2	80.7	74.2
300–399	87	87.5	96.1	72.7	70.1
≥400	92	88.2	96.3	91.4	87.7

[a]Uncorrected $\chi^2 = 31.61$, d.f. = 5, $F(4.01,2102.44) = 7.13$, $p < 0.0001$.

Table 6.
Percentage of Hospitals Monitoring Prescriber Adherence to Clinical Practice Guidelines (CPGs)

Technique	*n*	%
Hospital monitors prescriber adherence to CPGs	385	71.3
Committees or departments responsible for monitoring prescriber adherence to CPGs (*n* = 271)		
Quality assurance or quality improvement committee	33	44.6
Pharmacy and therapeutics committee	29	26.2
Hospital staff peer-review committee	43	11.6
Pharmacy department	61	6.6
Risk management committee	52	4.0
Other	53	7.0

ical practice guidelines and monitoring their use and are making greater contributions to the appropriate use of medications and patient safety.

Medication-use evaluation. A substantial majority (77.9%) of pharmacy directors reported that their hospital has a medication-use evaluation program designed to improve prescribing. The existence of such programs differs as a function of the number of staffed beds (uncorrected $\chi^2 = 42.93$, d.f. = 5, $p < 0.0001$). For example, 90.3% of hospitals with 400 or more staffed beds and 91.0% of those with 300–399 beds have medication-use evaluation programs. Such programs exist in only 60.6% of hospitals with fewer than 50 beds, 70.2% of hospitals with 50–99 beds, 87.5% of hospitals with 100–199 beds, and 84.7% of hospitals with 200–299 beds.

Pharmacy directors also indicated the extent to which hospitals undertake a variety of medication-use evaluation activities to improve prescribing and the extent of pharmacist involvement (Table 7). More than 90% of hospitals track adverse drug reactions, monitor trends, and perform retrospective drug-use evaluations. More than three fourths track pharmacist interventions, monitor trends, identify problem-prone or high-risk therapies using pre-established criteria, and routinely review culture and sensitivity reports. Nearly two thirds review compliance with clinical practice guidelines as a mechanism to improve prescribing. Less frequent activities include tracking treatment failures, assessing their trends, and evaluating patients' quality-of-life. However, the percentage of pharmacists involved in these latter two activities has increased from 1998.[8]

With the exception of tracking treatment failures and evaluating patients' quality of life, pharmacists are involved in activities associated with medication-use evaluation in at least 75% of hospitals.

Data collection and interventions. The pharmacy directors were asked to identify committees or activities in their hospitals and to specify whether trend data are used by that committee or in that activity to improve prescribing (Table 8).

P&T committees, infection control committees, and quality improvement committees exist in a majority of the respondents' hospitals. More than three fourths have risk management committees and hospital staff peer-review committees. At least two thirds of hospitals with these committees rely on trend data to improve prescribing.

In addition, a substantial number of hospitals develop formulary decisions, credential medical staff, and revise medication-use policies and procedures. More than two thirds provide formal education to prescribers on prescribing and design clinical practice guidelines. Over half of these hospitals use trend data in these activities. It seems reasonable that pharmacist involvement in these committees and activities will enhance their overall effectiveness and further improve the prescribing process.

Pharmacist consultations. 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 consultations are provided

Table 7.
Percentage of Respondents Reporting Selected Medication-Use Evaluation Activities To Improve Prescribing

Activity	*n*	Hospitals Engaged in Activity	
		%	% with Pharmacists Actively Involved in Activity
Tracking and assessing the trend of adverse drug reactions	433	99.4	97.9
Using retrospective drug-use evaluations	430	93.6	98.6
Tracking and assessing the trend of pharmacist interventions	431	83.6	99.2
Identifying problem-prone or high-risk therapies using preestablished criteria	431	82.9	98.3
Routinely reviewing culture and sensitivity reports	430	75.4	84.9
Complying with clinical practice guidelines	426	63.6	75.9
Tracking and assessing the trend of treatment failures	426	27.8	61.7
Tracking and monitoring patient quality of life	432	19.1	39.1

Table 8.
Percentage of Hospitals with Committees or Activities and Extent to Which They Use Trend Data

Committee or Activity	*n*	Hospitals Having Committee or Engaged in Activity	
		%	% Using Trend Data To Improve Prescribing
Committee			
Pharmacy and therapeutics committee	529	97.1	74.2
Infection control committee	528	95.2	71.4
Quality improvement committee	524	92.0	77.3
Risk management committee	525	81.3	65.9
Hospital staff peer-review committee	518	73.1	68.4
Activity			
Developing formulary decisions	526	92.3	69.5
Credentialing medical staff	523	90.3	53.5
Revising drug-use policies and procedures	526	89.9	65.5
Designing clinical practice guidelines	522	67.6	70.0
Providing formal education to prescribers	523	67.3	52.3

by pharmacists in their hospital, how many consultations occur each month, and what percentage of pharmacist recommendations are adopted by prescribers. Pharmacists at more than 75% of hospitals provide consultations on drug information, dosage adjustments for patients with renal impairment, antimicrobials, and pharmacokinetics (Table 9). About half of the respondents reported that pharmacists provide nutrition support and patient teaching consultations; less than 40% reported that pharmacists provide pain management, anticoagulation, and compliance and medical history consultations.

The provision of pharmacist consultations varied significantly by hospital size, with the exception of those consultations related to antimicrobials. With the exception of consultations involving anticoagulation, hospitals with 300 or more staffed beds were more likely to provide consultations than those in smaller staffed bed categories. Hospitals with fewer than 50 beds were most likely to offer consultations related to anticoagulation and were followed closely by the largest hospitals.

The average number of monthly consultations ranged from about 97 anticoagulation consultations to about 19 pain management consultations (Table 9). The average number of consultations is significantly greater as hospital size increases for all consultations examined, with the exception of compliance and medical histories (Table 10). For each type of consultation examined, more than half the pharmacy directors indicated that 80% or more of the recommendations made by pharmacists were adopted (Table 9).

These results suggest that pharmacists are making a significant contribution to prescribing by providing consultations to prescribers. Pharmacists have positioned themselves well to make these contributions, and the number of consultations per month suggests that these are not infrequent activities. It is not surprising that pharmacists in the largest hospitals provide significantly more consultations per month than those in smaller hospitals. This is most likely a function of the number of patients in the facilities

Table 9.
Percentage of Hospitals with Pharmacist Consultations

Type of Consultation	Consultation Provided		Consultations Provided per Month		Adoption Rate for Recommendations	
	n	%	*n*	Mean ± S.E.	*n*	% with >80% Adoption Rate
Drug information	527	91.9	451	50.6 ± 3.35	464	66.0
Dosage adjustments for patients with renal impairment	527	88.1	434	49.3 ± 3.29	454	72.7
Antimicrobial	528	78.8	384	39.4 ± 2.78	404	55.5
Pharmacokinetics	527	76.9	387	55.1 ± 4.55	400	85.3
Nutrition support	527	46.7	246	37.9 ± 4.35	255	76.9
Patient teaching	527	46.3	233	37.7 ± 4.73	209	87.3
Pain management	526	38.0	182	19.5 ± 3.52	187	65.9
Anticoagulation	526	33.8	174	97.5 ± 26.49	181	73.2
Compliance and medical history	524	18.1	82	42.4 ± 14.71	88	74.5

Table 10.
Mean Number of Pharmacist Consultations per Month

Technique	All Hospitals	Staffed Beds					
		<50	50–99	100–199	200–299	300–399	≥400
Anticoagulation	97.5	21.2[a]	24.4	39.0	67.5	239.4	323.7
Pharmacokinetics	55.1	9.5[b]	11.8	35.9	92.3	97.6	204.2
Drug information	50.6	16.2[c]	20.7	48.3	63.9	81.2	171.0
Dosage adjustments for renal impairment	49.3	13.7[d]	26.2	51.2	68.5	88.8	124.5
Compliance or medical history	42.4	27.5	20.4	20.2	42.7	37.8	165.8
Antimicrobial	39.4	13.0[e]	13.1	28.7	59.4	74.6	139.3
Nutrition support	37.9	3.0[f]	7.6	15.7	41.7	84.3	142.4
Patient education	37.7	18.1[g]	15.8	30.1	34.3	79.2	98.0
Pain management	19.5	5.6[h]	3.8	9.7	39.5	47.9	54.0

[a] $F(1,168) = 5.50$, $p < 0.0202$, analysis of variance (ANOVA).
[b] $F(1,381) = 80.38$, $p < 0.0001$, ANOVA.
[c] $F(1,445) = 72.88$, $p < 0.0001$, ANOVA.
[d] $F(1,428) = 121.21$, $p < 0.0001$, ANOVA.
[e] $F(1,378) = 68.28$, $p < 0.0001$, ANOVA.
[f] $F(1,240) = 42.67$, $p < 0.0001$, ANOVA.
[g] $F(1,227) = 16.61$, $p < 0.0001$, ANOVA.
[h] $F(1,176) = 13.84$, $p < 0.0003$, ANOVA.

and economies of scale to be able to provide higher levels of clinical service in larger institutions. Lastly, the high adoption rate of pharmacist recommendations suggests that pharmacists are well-respected members of the health care team who are making contributions that prescribers value for the care of patients.

Pharmacist-initiated medication orders. In 52.3% of hospitals, pharmacists have the authority, under protocol, to initiate medication orders. This varied significantly across hospital size (uncorrected $\chi^2 = 11.72$, d.f. = 5, $p < 0.0337$). Only 41.5% of hospitals with fewer than 50 staffed beds gave pharmacists the authority to initiate medication orders, whereas 49.5% of pharmacists in 50–99-bed hospitals, 54.4% of pharmacists in 100–199-bed hospitals, 56.6% of pharmacists in 200–299-bed hospitals, 66.7% of pharmacists in 300–399-bed hospitals, and 61.8% of pharmacists in hospitals with 400 or more beds had the authority to initiate medication orders under protocol.

Both prescribers and hospitals have confidence in pharmacists' knowledge and abilities, which explains why more than half the hospitals allow pharmacists to initiate medication orders. This finding has remained relatively constant over the past three years.[8]

Education of prescribers. Pharmacy directors were asked how their hospital provides objective drug information to prescribers (Table 11). Having pharmacists routinely answer questions is the most frequently cited method by which objective drug information is provided to prescribers (98.0%), followed by newsletters or bulletins (72.9%), disseminating the results of drug-use evaluations (64.3%), and continuing-education programs (62.7%). Approximately half of the respondents reported that their hospital provides an electronic drug information service or product (e.g., AHFSfirst [ASHP] or MICROMEDEX data-

Table 11.
Percentage of Hospitals Using Various Methods for Providing Prescribers with Objective Drug Information by Number of Staffed Beds

Method	All Hospitals (*n* = 529)	Staffed Beds <50 (*n* = 65)	50–99 (*n* = 94)	100–199 (*n* = 103)	200–299 (*n* = 85)	300–399 (*n* = 89)	≥400 (*n* = 93)
Staff pharmacists routinely answer questions	98.0	95.4	96.8	100	98.8	98.9	100
Newsletters or bulletins	72.9	64.6[a]	58.5	72.8	81.2	91.0	96.8
Disseminating results of medication-use evaluation	64.3	49.2[b]	58.5	65.1	71.8	84.3	83.9
Continuing-education programs	62.7	55.4	59.6	65.1	69.4	70.8	64.5
Electronic drug information service or product	48.1	35.4[c]	29.8	44.7	65.9	74.2	80.7
Evaluate and communicate prescribers' medication-use patterns	32.4	27.7	29.8	31.1	29.4	43.8	47.3
Pharmacist attending rounds	30.4	21.5[d]	10.6	24.3	42.4	52.8	74.2
Contract with another institution, organization, or poison control center	28.6	32.3	26.6	30.1	20.0	30.3	31.2
Staff position dedicated to provision of drug information	8.8	7.7[e]	3.2	4.9	8.2	13.5	31.2
Academic detailing	7.9	4.6	4.3	8.7	11.8	10.1	14.0
Formal drug information center	5.7	3.1[f]	1.1	0.0	8.2	13.5	26.9

[a]Uncorrected $\chi^2 = 39.66$, d.f. = 5, $F(3.98,2082.11) = 9.01$, $p < 0.0001$.
[b]Uncorrected $\chi^2 = 30.98$, d.f. = 5, $F(4.02,2102.63) = 6.95$, $p < 0.0001$.
[c]Uncorrected $\chi^2 = 65.07$, d.f. = 5, $F(4.03,2108.90) = 14.46$, $p < 0.0001$.
[d]Uncorrected $\chi^2 = 88.14$, d.f. = 5, $F(4.09,2139.36) = 19.23$, $p < 0.0001$.
[e]Uncorrected $\chi^2 = 40.11$, d.f. = 5, $F(4.19,2190.91) = 8.53$, $p < 0.0001$.
[f]Uncorrected $\chi^2 = 62.52$, d.f. = 5, $F(3.71,1938.41) = 14.50$, $p < 0.0001$.

base). Approximately one third of hospitals evaluate prescriber medication-use patterns and communicate the results (32.4%), allow pharmacists to attend rounds (30.4%), and cite a contract with another institution, organization, or poison control center (28.6%). Less frequently used mechanisms include a dedicated staff position to provide objective drug information to prescribers (8.8%), academic detailing (7.9%), and a formal drug information center (5.7%). Larger hospitals are significantly more likely to offer newsletters or bulletins, disseminate the results of medication-use evaluations, provide an electronic drug information product, dedicate a staff position to the provision of drug information, have a formal drug information center, and allow pharmacists to attend rounds as methods of providing prescribers with objective drug information.

With the reduction from 1998 in formal drug information centers and dedicated staff to respond to drug information questions, there appears to be greater integration of existing pharmacists' job responsibilities.[8]

Transcribing. The transcribing process contains technical and cognitive components. Some examples of the technical component include prescribers copying medication orders to the medication administration record (MAR), nurses recording orders on a cardex system, and pharmacists entering medication orders into the pharmacy computer system. The cognitive component includes reviewing and assessing medication orders for appropriateness.

A majority of pharmacy directors reported four actions taken to ensure accurate transcription of medication orders: clarification of illegible orders before transcription or entry into MARs, use of standardized prescriber order forms, requiring prescribers to countersign all oral orders, and reconciliation of MARs and pharmacy patient profiles at least daily (Table 12). Other actions taken less frequently include requiring all oral orders to be read back (including the drug name, dose, dosage form, and the spelling of the patient's name and drug name) using special transcribing procedures for high-risk medications, and requiring prescribers to print or type all medication orders when computer order entry is not available. Notably, more than 30% of hospitals with 300 or more staffed beds require special transcribing for high-risk medications, while less than 20% of hospitals with fewer than 300 beds require such precautions (uncorrected $\chi^2 = 16.95$, d.f. = 5, $p < 0.0054$). These results suggest that pharmacists are taking precautions to ensure accurate transcription of medication orders. These results may also stimulate some hospitals to consider additional actions to avoid other opportunities for error.

Pharmacy directors were asked to indicate the percentage of medication orders evaluated for appropriateness by pharmacists when being entered into the pharmacy computer system (Table 13). More than 75% of respondents reported that their

Table 12.
Percentage of Hospitals Undertaking Actions to Ensure Accurate Transcription of Medication Orders (*n* = 521)

Action	%
Clarify any illegible order before transcribing or entering it into MAR[a]	89.8
Use standardized prescriber order forms	89.6
Countersign oral orders	83.0
Reconcile MARs and pharmacy patient profiles at least daily	63.2
Read back all oral orders, including the drug name, dose, dosage form, and name of the patient, and spell drug name	31.4
Use special procedures for transcribing orders for high-risk drugs	17.3
Print or type all medication orders if prescribers cannot enter orders into computer	3.9

[a]MAR = medication administration record.

Table 13.
Cognitive Assessments Pharmacists Perform when Transcribing Medication Orders to the Pharmacy's Patient Profile

Cognitive Assessment	*n*	% Evaluating Information in >75% of Orders Entered
Medication allergies	527	95.1
Drug interactions	525	89.6
Age	525	76.7
Drug regimen	525	75.9
Safety and efficacy of prescribed dose	525	72.5
Double-check chemotherapy regimen	486	72.1
Existing drug orders	524	57.6
Renal function when noted in medical record	521	50.6
Weight	523	41.1
Diagnosis and concurrent diseases	518	36.2
Height	520	27.3
Ongoing DUE[a] program	518	25.7
Laboratory findings not related to renal function	516	20.4
Medication history	519	14.4
Disease history for family	517	5.1

[a]DUE = drug-use evaluation.

pharmacists evaluate more than 75% of medication orders with respect to medication allergies, drug interactions, patient age, appropriateness of drug regimen (i.e., administration schedule), and the safety and efficacy of prescribed doses. Pharmacists also double-check orders for different chemotherapy regimens. In addition, an estimated 50% of hospitals evaluate more than 75% of orders by comparing the dosage forms to existing medication orders and evaluating renal function when noted in the medical record.

The widespread use of computers allows for better screening of medication orders when entered into the pharmacy computer system. Pharmacists are making important contributions by evaluating these computer-identified potential medication misadventures and detecting other potential adverse drug events that computer programs are incapable of identifying. For instance, many medications given to the elderly are administered at doses less than those for the nonelderly. By not evaluating every medication order for elderly patients, doses beyond those which would be considered appropriate may result. Improvement is clearly needed in this area. With the public focused on patient safety, evaluating *most* orders may not be enough. Rather, it seems prudent for pharmacy to establish a goal to evaluate all orders before a dose is dispensed to a patient and to invest the significant amount of energy necessary to reach that goal.

All medication orders must be evaluated for patient allergies and possible drug interactions. Other activities, such as switching patients from injectable agents to oral formulations, are important but have a substantially different focus (i.e., cost control and reduction). Some activities may not be possible given information-system limitations. For example, information about a patient's renal function and other laboratory test values may not be available to the pharmacists using the pharmacy computer order-entry system.

These reported statistics highlight the importance of screening orders appropriately. Not all orders must be evaluated in accordance with all of these types of information. However, pharmacists and pharmacy departments must be vigilant to screen every order against appropriate criteria and apply screening activities to crucial patient groups.

Prescriber order-entry systems. One technique used to improve patient safety that bypasses the need to interpret handwritten medication orders is the use of prescriber order-entry systems.[14] Only 4.3% of hospitals have prescriber order-entry systems, and larger hospitals use these systems significantly more often than smaller ones (Table 14). For example, only 1.5% of hospitals with fewer than 200 beds use prescriber order-entry systems, while more than 20% of hospitals with 400 or more staffed beds employ such systems to improve patient safety. Of those hospitals with 300 beds or more that use prescriber order-entry systems, 35.7% have prescribers enter more than 75% of the medication orders, 17.9% have prescribers enter 51–

Table 14.
Use of Computerized Prescriber Order-Entry Systems by Selected Hospital Characteristics

Characteristic	Hospitals with Prescriber Order-Entry System	
	n	%
All hospitals	530	4.3
Staffed beds		
<50	66	1.5[a]
50–99	93	1.1
100–199	104	1.9
200–299	85	3.5
300–399	89	10.1
≥400	93	20.4

[a] $F(1,524) = 27.07$, $p < 0.0001$, analysis of variance.

75% of medication orders, and 32.1% have prescribers enter 26–50% of medication orders.

While nearly three fourths of hospitals have information-system linkages that transfer data from the prescriber order-entry system into the pharmacy computer system, 25.7% of hospitals require the reentry of medication orders into the pharmacy database. Of hospitals with prescriber order-entry systems, only 15.8% with 400 or more staffed beds must manually reenter medication orders into the pharmacy computer system. This is in comparison to 33.3% of hospitals with 300–399 beds and 47.2% of those with 299 or fewer beds that must do the same. Further, 91.2% of hospitals require that pharmacists verify the appropriateness of all medication orders entered into the prescriber order-entry system before dispensing them from the central or satellite pharmacy, 75.9% require verification when medications are distributed from decentralized automated cabinets, and 54.8% require verification when medications are accessed from floor stock areas. Verification is only required when it would not cause a medically unacceptable delay.

In 1998, only 35% of hospitals had prescribers electronically enter more than 25% of medication orders.[8] These new data suggest greater adoption and integration of prescriber order-entry systems into effective medication-safety activities. Most alarming are the 25.7% of hospitals with prescriber order-entry systems that require reentry of medication orders into the pharmacy computer system. This dangerous practice, possibly resulting in mistranscription of medication orders, can be changed with information systems that allow the transfer of data from the prescriber order-entry system to the pharmacy database after the order is verified by the pharmacist. At best, the practice of reentering orders is merely task redundancy; at worst, it is an opportunity for error and thus an issue of patient safety.

Hospital and pharmacy activity levels

Several measures of annual hospital and pharmacy activity levels are presented in Tables 15–21.

Outpatient visits and operating expenses. The numbers of outpatient visits are reported by hospital characteristic in Table 15. Larger hospitals have more outpatient visits. Operating expenses are reported in Table 16. Larger hospitals had higher operating expenses.

The past fiscal year's total inpatient pharmacy operating expenses differed significantly according to the institution's number of staffed beds, with larger hospitals having higher expenses (Table 17). A similar relationship was found between the inpatient pharmacy's total acquisition cost for pharmaceuticals excluding i.v. fluids and sets (Table 18) and the total acquisition cost for i.v. fluids and sets (Table 19).

Inventory value. Inpatient pharmacy inventory values varied significantly by hospital size, with larger hospitals reporting higher inpatient pharmacy inventory values than smaller ones (Table 20).

Staffing. Respondents reported that their hospital had an average of nine full-time-equivalent (FTE) pharmacists (i.e., working 40 hours per week), but this number varies significantly by hospital size (Table 21). The larger the hospital, the greater the number of FTE pharmacists. Respondents reported an average of eight FTE technicians, but this also varies significantly by hospital size. As with pharmacists, the larger the hospital, the greater the number of FTE technicians.

Previous estimates of staffing levels for large hospitals were subject to the limitation of small sample sizes. These data provide more reliable estimates of staffing levels for all hospital sizes.

The ratio of pharmacists to technicians is similar across hospital sizes (range, 1.02 to 1.19). This ratio appears suboptimal. While it is acknowledged that technology (i.e., robotic distribution mechanisms, prescriber order-entry systems, medication distribution cabinets, automated compounding devices) can replace personnel, the consistency of the pharmacist-to-technician ratio across hospital sizes suggests that technology adoption may not be a good predictor of ratio. Further, given the current shortage of pharmacists and the difficulty many pharmacy directors face in filling pharmacist positions, it seems prudent to consider increasing the hiring and deployment of qualified pharmacy technicians.

These findings may provide some information for pharmacy managers about key benchmarks. However, caution should be exercised when in-

Table 15.
Outpatient Visits in Prior Fiscal Year

Characteristic	*n*	% <250,000 Visits	250,000–499,999 Visits	500,000–749,999 Visits	≥750,000 Visits
All hospitals	483	78.1	15.5	3.3	3.1
Staffed beds[a]					
<50	61	93.4	6.6	0.0	0.0
50–99	90	95.6	4.4	0.0	0.0
100–199	95	75.8	21.1	1.1	2.1
200–299	74	75.7	17.6	5.4	1.4
300–399	79	41.8	35.4	16.5	6.4
≥400	84	39.3	28.6	1.2	20.2

[a] $F(11.79,5625.94) = 13.37$, $p < 0.0001$, analysis of variance.

Table 16.
Hospital Total Operating Expenses in Prior Fiscal Year

Characteristic	*n*	% <$50 Million	$50–$99 Million	$100–$199 Million	≥$200 Million
All hospitals	461	53.8	19.4	15.3	11.6
Staffed beds[a]					
<50	59	88.1	8.5	3.4	0.0
50–99	87	85.1	9.2	5.8	0.0
100–199	89	43.8	37.1	15.7	3.4
200–299	71	23.9	28.2	38.0	9.8
300–399	73	8.2	30.1	31.5	30.1
≥400	82	0.0	3.7	22.0	74.4

[a] $F(12.99,5911.97) = 27.68$, $p < 0.0001$, analysis of variance.

Table 17.
Inpatient Pharmacy Total Operating Expenses in Prior Fiscal Year

Characteristic	*n*	% <$1 Million	$1–$9 Million	$10–$19 Million	≥$20 Million
All hospitals	518	31.7	53.5	10.0	4.8
Staffed beds[a]					
<50	63	73.0	25.4	1.6	0.0
50–99	93	54.8	44.1	1.1	0.0
100–199	100	13.0	80.0	7.0	0.0
200–299	80	1.3	83.8	11.3	3.8
300–399	89	1.1	58.4	30.3	10.2
≥400	93	1.1	25.8	37.6	35.5

[a] $F(12.83,6567.1) = 30.95$, $p < 0.0001$, analysis of variance.

Table 18.
Inpatient Pharmacy Total Acquisition Cost of Pharmaceuticals Excluding I.V. Fluids and Sets in Prior Fiscal Year

Characteristic	*n*	% <$1 Million	$1–$9 Million	$10–$19 Million	≥$20 Million
All hospitals	518	42.1	48.9	7.1	1.9
Staffed beds[a]					
<50	63	85.7	14.3	0.0	0.0
50–99	93	66.7	33.3	0.0	0.0
100–199	100	27.0	71.0	2.0	0.0
200–299	81	6.2	84.0	8.6	1.2
300–399	89	5.6	70.8	19.1	4.5
≥400	92	6.5	39.1	40.2	14.2

[a] $F(10.60,5425.33) = 36.39$, $p < 0.0001$, analysis of variance.

Table 19.
Total Inpatient Pharmacy I.V. Fluid and Set Costs in Prior Fiscal Year

Characteristic	*n*	Do Not Purchase I.V.s	%				
			<$100,000	$100,000–$249,999	$250,000–$499,999	$500,000–$999,999	≥$1 Million
All hospitals	503	15.9	35.8	28.2	13.1	4.5	2.6
Staffed beds[a]							
<50	60	20.0	58.3	18.3	1.7	1.7	0.0
50–99	91	19.8	58.2	15.4	4.4	2.2	0.0
100–199	100	14.0	24.0	41.0	17.0	3.0	1.0
200–299	77	13.0	18.2	37.7	23.4	5.2	2.6
300–399	86	10.5	12.8	37.2	25.6	11.6	2.4
≥400	89	11.2	10.1	23.6	23.6	13.5	18.0

[a] $F(21.58,10724.46) = 8.10$, $p < 0.0001$, analysis of variance.

Table 20.
Inpatient Pharmacy Inventory Value ($) in Prior Fiscal Year

Characteristic	*n*	%				
		<$100,000	$100,000–$249,999	$250,000–$499,999	$500,000–$999,999	≥$1 Million
All hospitals	518	30.7	35.2	20.5	8.6	5.1
Staffed beds[a]						
<50	62	66.1	29.0	4.8	0.0	0.0
50–99	93	57.0	35.5	4.3	1.1	2.2
100–199	101	13.9	52.5	26.7	4.0	3.0
200–299	82	1.2	40.2	42.7	12.2	3.7
300–399	88	2.3	21.6	42.1	27.3	6.8
≥400	92	1.1	7.6	26.1	35.9	29.4

[a] $F(18.93,9691.64) = 19.20$, $p < 0.0001$, analysis of variance.

Table 21.
Pharmacy Staffing in Prior Fiscal Year[a]

Characteristic	*n*	FTE Pharmacists, Mean ± S.E. (95% CI)	FTE Pharmacy Technicians, Mean ± S.E. (95% CI)
All hospitals	511	9.4 ± 0.34 (8.8, 10.1)	8.3 ± 0.29 (7.7, 8.9)
Staffed beds			
<50	56	1.9 ± 0.17 (1.5, 2.2)[b]	1.6 ± 0.20 (1.2, 2.0)[c]
50–99	89	3.0 ± 0.29 (2.5, 3.6)	2.8 ± 0.27 (2.3, 3.3)
100–199	103	6.3 ± 0.47 (5.3, 7.2)	6.2 ± 0.45 (5.3, 7.1)
200–299	84	12.0 ± 1.25 (9.6, 14.5)	10.6 ± 1.08 (8.5, 12.8)
300–399	86	18.7 ± 1.26 (16.3, 22.2)	16.0 ± 0.97 (14.1, 17.9)
≥400	93	35.2 ± 2.25 (30.8, 39.7)	29.6 ± 1.91 (25.8, 33.3)

[a] FTE = full-time equivalent (40 hr/wk), CI = confidence interval.
[b] $F(1,505) = 358.86$, $p < 0.0001$, analysis of variance (ANOVA).
[c] $F(1,505) = 354.32$, $p < 0.0001$, ANOVA.

terpreting these data. Not all hospitals are the same. While these data provide an average, each hospital offers unique products and services that are likely to present key challenges to these benchmarks.

Summary and conclusion

Patient safety and adverse drug events continue to concern the public. After the ASHP National Survey of Pharmacy Practice in Acute Care Settings: Prescribing and Transcribing—1998 was published,[8] the landmark report of the Committee on Quality of Healthcare in America, To Err is Human—Building a Safer Health System, was released.[15] In this report, medication errors were highlighted as the most common cause of adverse events, with the majority of errors occurring during the prescribing phase. In the more recent publication of the second report of the Committee on Quality of Healthcare in America, Crossing the Quality Chasm—A New Health System for the 21st Century, patient safety is listed as the first of six aims for the 21st century's health care system.[16] It states the importance of "avoiding injuries to patients from the care that is intended to help them." It also

lists effectiveness and efficiency as two of the rules by which a new health system should be designed. Effectiveness was defined as "providing services based on scientific knowledge to all who could benefit and refraining from providing services to those not likely to benefit (avoiding underuse and overuse, respectively)." Efficiency was defined as "avoiding waste, including waste of equipment, supplies, ideas, and energy." Improving the effectiveness, safety, and efficiency of medication use by improving prescribing and transcribing is as important now as it has ever been.

The response rates and results of this survey were relatively comparable to those reported in previous years. There was a slight reduction in the percent of occupancy, length of stay, staffing, and weekly hours of operation of both inpatient and outpatient pharmacies.

The P&T committee continues to be a forum used in virtually all hospitals to discuss the policies related to medication therapy, including formulary systems. The percentage of P&T committees using various techniques remained mostly the same, but there was a slight reduction in the percent regularly reviewing therapeutic categories, nonformulary medications, prescriber adherence to medication-use policies, and prior approval of nonformulary medication use. It is likely that the increase in acuity combined with the reduction in staffing and the fewer hours of operation are reducing the intensity of these activities. This may result in less effective, less safe, and more costly therapies. Strategies to improve prescribing in hospital settings may include the use of one or more of these less frequently performed activities of the P&T committee. However, current personnel shortages and cost pressures are likely to place pressure on pharmacists who want to maintain or increase their activities in this area.

Many of the other activities surveyed previously continue to rank highly. Examples of patient safety activities include screening orders for drug interactions, evaluating patients for drug allergies, and evaluating doses on the basis of a patient's weight, age, and organ system function. While pharmacists can be pleased that these practices are in place in most hospitals, it could be argued that such practices should be present in all hospitals. For example, the case could be made that all prescribed therapies should be reviewed to prevent drug interactions and avoid administering the prescribed medication to patients with a known allergy to the drug. Studies continue to show that many adverse drug events result from errors in prescribing.[17] The emerging use of prescriber order-entry systems utilizing decision support logic may increase the percentage of hospitals with these safeguards to more appropriate levels.

Certain activities are still not routinely done in most hospitals, despite evidence that they could improve prescribing and transcribing, resulting in more positive treatment outcomes, fewer adverse drug events, and more cost-effective therapy. Examples include tracking treatment failures, monitoring trends, and implementing consultation programs for high-risk treatments, such as nutrition support, pain management, anticoagulation, and compliance monitoring. Electronic drug information resources are used in fewer than half of the hospitals surveyed. Despite evidence that pharmacists can reduce adverse drug events by two thirds,[18] less than one third of hospitals have pharmacists attending rounds. Academic detailing has been shown to improve both drug therapy and decision-making,[19] yet it was only reported to be in use in 7.9% of the hospitals surveyed. "Hear-back," repeating an oral order to confirm it, has been widely recommended as a tool to improve patient safety in health care; yet, only 31.4% of respondents reported using this very simple technique. All of these strategies are underused as methods to improve prescribing and transcribing.

Prescriber order-entry systems have been recommended as a "top priority" for improving the prescribing process and reducing the need for transcription of medication orders.[8,20] Purchasers of health care, including those on the Leapfrog Group (a leading group of Fortune 500 companies and other large health care purchasers committed to common purchasing principles to promote "leaps" in patient safety), have stated their intent to require these systems in the hospitals from which they contract for health care. These systems are expensive and can be difficult to implement. Not surprisingly, larger hospitals have more prescriber order-entry systems than smaller ones. Of concern, however, is that even in hospitals that have such systems, medication orders often must be reentered into a pharmacy computer, creating another opportunity for error. Therefore, these systems should be integrated with pharmacy and nursing computer systems so that redundant, error-prone reentry of orders is not needed. This area of practice will be the most likely to change over time.

The infrastructure and technology for improving prescribing and transcribing of medication orders are in place in many hospitals. Pharmacists are taking an active leadership role in improving medication safety through their collaborative work with the medical and nursing staffs to develop, maintain, and improve programs and systems that measure and improve prescribing and transcribing. Adverse medical events that result from errors in prescribing and transcribing medication orders should not be taken for granted. As the number of new pharmacologic agents continues to rise, the

acuity of patient care increases, and personnel considerations affect health care, hospitals should not lose sight of the systems that have been shown to improve prescribing and transcribing medication orders or the need to strengthen them.

References

1. Dillman DA. Mail and Internet surveys: the tailored design method. 2nd ed. New York: Wiley; 2000.
2. U.S. Bureau of the Census. Statistical abstracts of the United States. Washington, DC: U.S. Government Printing Office; 1996:1,937.
3. SMG abridged hospital database. Chicago: SMG Marketing Group; 2001 Mar.
4. Dillman DA. Mail and Internet surveys: the tailored design method. 2nd ed. New York: Wiley; 2000:16,167-70.
5. American Hospital Association. Hospital statistics, 1999 ed. Chicago: Health Forum; 1999.
6. Levy PS, Lemeshow S. Sampling of populations: methods and applications. 3rd ed. New York: Wiley; 1999:121-89.
7. Alreck PL, Settle RB. The survey research handbook. 2nd ed. Chicago: Irwin; 1995:35.
8. Ringold DJ, Santell JP, Schneider PJ et al. ASHP national survey of pharmacy practice in acute care settings: prescribing and transcribing—1998. *Am J Health-Syst Pharm.* 1999; 56:142-57.
9. Ringold DJ, Santell JP, Schneider PJ. ASHP national survey of pharmacy practice in acute care settings: dispensing and administration—1999. *Am J Health-Syst Pharm.* 2000; 57:1759-75.
10. Pedersen CA, Schneider PJ, Santell JP et al. ASHP national survey of pharmacy practice in acute care settings: monitoring, patient education, and wellness—2000. *Am J Health-Syst Pharm.* 2000; 57:2171-87.
11. Reeder CE, Dickson M, Kozma CM et al. ASHP national survey of pharmacy practice in acute care settings—1996. *Am J Health-Syst Pharm.* 1997; 54:653-69.
12. Santell JP. ASHP national survey of hospital-based pharmaceutical services—1994. *Am J Health-Syst Pharm.* 1995; 52: 1179-98.
13. Kozma CM, Reeder CE, Schulz RM. Economic, clinical, and humanistic outcomes: a planning model for pharmacoeconomic research. *Clin Ther.* 1993; 15: 1121-32.
14. ASHP policy statement on computerized prescriber order-entry. ASHP Government Affairs Regulatory Summary. www.ashp.org/public/hq/council01/clpa.html. 2001 Jun.
15. Kohn LT, Corrigan JM, Donaldson MS. To err is human—building a safer health system. Washington, DC: National Academy Press; 1999.
16. Corrigan JM, Donaldson MS, Kohn LT et al. Crossing the quality chasm—a new health system for the 21st century. Washington, DC: National Academy Press; 2001.
17. Senst BL, Achusim LE, Genest RP et al. Practical approach to determining costs and frequency of adverse drug events in a health care network. *Am J Health-Syst Pharm.* 2001; 58:1126-32.
18. Leape LL, Cullen DJ, Clapp MD et al. Pharmacist participation on physician rounds and adverse drug events in the intensive care unit. *JAMA.* 1999; 282: 267-70.
19. Avorn J, Soumerai SB. Improving drug-therapy decisions through educational outreach—a randomized controlled trial of academically based 'detailing.' *N Engl J Med.* 1983; 308:1457-63.
20. Top-priority actions for preventing adverse drug events in hospitals. *Am J Health-Syst Pharm.* 1996; 53:747-51.