

Pharmacy Services in Hospitals Offering Clinical Clerkships

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As part of an ongoing multi-year project investigating hospital-based clinical pharmacy services, the variation in clinical pharmacy services among hospitals with various teaching affiliations was studied. Survey documents, completed by the director of pharmacy, were completed for 1597 hospitals, representing 43 percent of the nation's acute care general medical surgical hospitals. Hospitals were grouped according to their affiliation with colleges of pharmacy degree programs and other health care teaching programs. Clear differences were observed in the types of clinical pharmacy services among: PharmD affiliated hospitals, hospitals affiliated with BS pharmacy programs only, hospitals affiliated with nonpharmacy teaching programs, and hospitals without any involvement in health care education. Both BS and PharmD program affiliated hospitals were most likely to be nonprofit nongovernment hospitals. Only 10 percent of college of pharmacy affiliated hospitals were for-profit institutions. PharmD programs had a greater mix of small, medium and large-sized affiliated hospitals; whereas BS pharmacy programs were commonly affiliated with small and medium-sized hospitals. Hospitals affiliated with PharmD programs cared for more severely ill patients than hospitals affiliated with BS pharmacy programs (higher Health Care Finance Administration case mix index). Results suggest that the clinical pharmacy services offered in hospitals vary significantly by several factors related to teaching affiliation; including both the academic affiliation and the type of pharmacy degree program.

INTRODUCTION

Pharmacy education and pharmacy practice continue to develop a mutually beneficial and synergistic relationship. Faculty and practitioners have worked together to create contemporary and challenging clinical clerkships(1-3). Hospitals are often the site of clerkship experiences, with more than one-half of the nation's acute care hospitals serving as a clinical clerkship site(4) Despite the importance of hospital-based clerkships for pharmacy education, the clinical pharmacy services offered in teaching hospitals have not been studied. Thus, there may be no uniform exposure to clinical pharmacy services among students completing clinical clerkships. With the implementation of more entry-level Doctor of Pharmacy Programs (PharmD), hospitals previously offering clerkships to only baccalaureate pharmacy students may be asked to provide clerkships for PharmD students. The greater length, intensity, and number of PharmD clerkships will likely stimulate formation of new affiliation agreements between hospitals and the colleges of pharmacy(5). These affiliation agreements often describe mutual accountability (*i.e.*, the types of experiences students should receive during their clerkships and the support the colleges should provide the hospital and the practice-based instructors) (6). The differences in clinical pharmacy service offerings among hospitals affiliated with varying teaching programs has not been studied; this is the first paper to explore this important area.

Two ongoing studies of hospital-based pharmacy services exist, but provide limited information on the variations in pharmacy services among hospitals of different teaching involvement. The Lilly Hospital Pharmacy Survey provides hospital operations data. It is prepared for "pharmacy directors in the interest of sound management"(7) Provided as a service to the profession, the Lilly survey does not define its

sample and presents only averages of data. Hospitals are usually presented as a homogeneous group; differentiation of pharmacy services is provided only for general hospitals or specialized hospitals.

The last ASHP national survey of hospital-based pharmaceutical services evaluated 393 hospitals(8). Although teaching affiliation with pharmacy schools was explored, hospitals were not grouped according to their types of teaching affiliation. Therefore, the relationships between type of degree program affiliation and clinical pharmacy services offering could not be explored. The National Clinical Pharmacy Services Survey, maintained by the authors, is the largest and most comprehensive data base of hospital-based pharmacy services; beginning with a large regional study in 1987, and national studies in 1989, 1992 and 1995(4,9,10). The objectives of this study were to compare: (i) hospital-based clinical pharmacy services according to college of pharmacy affiliation and the type of college degree program; (ii) hospital ownership, size, pharmacy director's educational background, and type of pharmacist practice model by various college of pharmacy degree programs; and (iii) the severity of illness of patients in hospitals affiliated with varying degree programs. These factors have been shown in earlier studies to be associated with the levels of hospital-based clinical pharmacy services(4,9,10).

METHODS

A survey instrument previously used in a national survey was updated and pretested by 25 directors of pharmacy; in 1992, the modified questionnaire was mailed to the director of pharmacy in each acute-care general medical surgical hospital and acute care pediatric hospital that had 50 or more licensed beds according to the 7 997 *American Hospital Association Abridged Guide to the Health Care Field on*

Table I. Variation in provision of clinical pharmacy services by college of pharmacy affiliation

	Hospital affiliation With college of pharmacy		Significance ^a
	Yes (N=839) n (percent)	No (N=758) n (percent)	
Inpatient clinical pharmacy service			
Drug-use evaluation	803 (95.7)	719 (94.9)	NS ^b
Inservice or continuing education	643 (76.6)	452 (59.6)	$\chi^2=53.4$, $P<0.00001$
Adverse drug reaction management	609 (72.6)	474 (62.5)	$\chi^2=18.4$, $P<0.001$
Pharmacokinetics consultation	559 (66.6)	310 (40.9)	$\chi^2=106.3$, $P<0.00001$
Drug therapy monitoring	422 (50.3)	275 (36.3)	$\chi^2=31.8$, $P<0.00001$
Drug therapy protocol management	364 (43.4)	222 (29.3)	$\chi^2=34.1$, $P<0.00001$
Parenteral/enteral nutrition tea	363 (43.3)	207 (27.3)	$\chi^2=44.2$, $P<0.00001$
Medication counselling	345 (41.1)	165 (21.8)	$\chi^2=68.8$, $P<0.00001$
Cardiopulmonary arrest team	286 (34.1)	196 (25.9)	$\chi^2=12.8$, $P<0.001$
Drug information	256 (30.5)	129 (17.0)	$\chi^2=39.6$, $P<0.00001$
Rounds	246 (29.3)	43 (5.7)	$\chi^2=150.3$, $P<0.00001$
Clinical research	177 (21.1)	25 (3.3)	$\chi^2=114.2$, $P<0.00001$
Poison information	171 (20.4)	103 (13.6)	$\chi^2=12.9$, $P<0.001$
Written admission medication histories	43 (5.1)	14 (1.8)	$\chi^2=12.4$, $P<0.001$

^adf = 1.^bNS = Not significant.

Diskette (AHA Abridged Guide) and had one or more licensed pharmacists according to the *AHA Annual Survey Data Tape*(11,12). Specialty hospitals such as rehabilitation, psychiatric, and chemical dependency hospitals were not included. Major areas addressed in the questionnaire included: basic hospital and pharmacy department characteristics, inpatient clinical pharmacy services, ambulatory pharmacy services, and pharmacy personnel and budget. All items were closed-ended and required either checking a response box or filling in a number.

Definitions of questionnaire terms and subsequent groupings used in analysis are included in the Appendix. Data analysis was based on grouping hospitals by five factors shown to be associated with statistically significant variation in the provision of clinical pharmacy services: (i) hospitals were assigned to one of three size categories based on their ADC, the best indicator of pharmacist case load; (ii) hospital ownership was described by one of four groupings identified in the AHA data base(12); (iii) hospitals were assigned to one of four teaching categories: affiliation with a college of pharmacy PharmD program, a college of pharmacy BS pharmacy program only, no college of pharmacy affiliation but affiliation with other health education programs, or no affiliation with any health education program; (iv) the factor "pharmacist's practice model" described one of three predominant systems in each hospital: decentralized pharmacists, centralized pharmacists who visited the patient care area daily, or centralized pharmacists without daily patient care area duties; and (v) each hospital was assigned to one of four groups according to the current pharmacy director's educational background as described in the Appendix. A detailed description of the rationale for selecting these factors has been previously published(4,10).

The Health Care Finance Administration's (HCFA) Medicare Case Mix Index was used to assess the severity of illness of patients(13). The HCFA case mix index is a relative measure for severity of illness for Medicare patients and is based on diagnosis-related groups for Medicare patients and compares each hospital's cost per case relative to the national average. The HCFA case mix index for 1992 was first available in late fall 1993. Although the case mix

index is calculated only for Medicare patients, it correlates highly with a hospital's overall case mix for Medicare and non-Medicare patients(14)

All data was reduced to a machine readable format. SPSS release 6.0 was used to perform the analysis(15). Statistical tests used included simple descriptive statistics, chi-square analysis, and one way ANOVA preceding Scheffe multiple pairs comparison of the means. The *a priori* level of significance for all tests was 0.05.

RESULTS

A final return rate of 1,597 usable questionnaires resulted in a 43 percent response rate of all United States acute care general medical surgical and pediatric hospitals: (See Table I.) Of the 3,720 questionnaires mailed, six were returned unusable. Respondents and nonrespondents did not differ by: hospital ownership, hospital size, and membership in the Council of Teaching Hospitals. Of the 1,597 hospitals studied, 803 (53 percent) had a teaching affiliation with a college of pharmacy (defined as one or more students completing academic course work within that hospital and its ambulatory facilities each year). Among all hospitals, 170 (11 percent) were a member of the Council of Teaching Hospitals (COTH, see Appendix), 692 (43 percent) were affiliated with a college of pharmacy but were not a member of the COTH, 429 (27 percent) had a teaching affiliation with a college of medicine, nursing, or allied health program but not a college of pharmacy, and 306 (19 percent) were not affiliated with any health care teaching college. Nonpharmacy teaching affiliations included: medical colleges (34 percent), nursing colleges (60 percent), allied health programs (36 percent), and health care administration (12 percent). Sixty-seven percent of hospitals affiliated with a college of pharmacy had a written plan for expanding clinical pharmacy services or implementing pharmaceutical care. Pharmacists had the authority to enter documentation of their actions into the medical record in 921 (58 percent) of the hospitals(4).

Of the fourteen inpatient clinical pharmacy services studied, thirteen were more likely to be present in hospitals with a college of pharmacy teaching affiliation than in those

Table II. Variation in provision of clinical pharmacy services by degree program affiliation

Inpatient clinical pharmacy service	Hospital teaching affiliation				Significance ^a
	PharmD (n=333) n (%)	BS Pharmacy only (n=506) n (%)	Nonpharmacy teaching (n=451) n (%)	Nonteaching (n=307) n (%)	
Drug-use evaluation	317 (95.2)	486 (96.0)	432 (95.8)	287 (93.5)	NS ^b P<0.00001
Inservice or continuing education	361 (84.7)	282 (84.7)	282 (62.5)	170 (55.4)	$\chi^2=71.4$, P<0.00001
Adverse drug reaction management	259 (77.8)	350 (69.2)	283 (62.7)	116 (62.2)	$\chi^2=25.3$, P<0.00001
Pharmacokinetics consultation	273 (82.0)	286 (56.5)	196 (43.5)	114 (37.1)	$\chi^2=161.7$, P<0.00001
Drug therapy monitoring	207 (62.2)	215 (42.5)	165 (36.6)	110 (35.8)	$\chi^2=63.5$, P<0.00001
Drug therapy protocol management	186 (55.9)	178 (35.2)	136 (30.2)	86 (28.0)	$\chi^2=71.4$, P<0.00001
Parenteral/enteral nutrition team	199 (59.8)	164 (32.4)	132 (29.3)	75 (24.4)	$\chi^2=111.5$, P<0.00001
Medication counselig	164 (49.2)	181 (35.8)	102 (22.6)	63 (20.5)	$\chi^2=85.8$, P<0.00001
Cardiopulmonary arrest team	130 (39.0)	156 (30.8)	122 (27.1)	74 (24.1)	$\chi^2=20.0$, P<0.001
Drug information	140 (42.0)	116 (22.9)	76 (16.9)	53 (17.3)	$\chi^2=79.8$, P<0.0000
Rounds	156 (46.8)	90 (17.8)	34 (7.5)	9 (2.9)	$\chi^2=267.3$, P<0.00001
Clinical research	124 (37.2)	53 (10.5)	19 (4.2)	6 (2.0)	$\chi^2=245.2$, P<0.00001
Poison information	84 (25.2)	87 (17.2)	66 (14.6)	37 (12.1)	$\chi^2=22.9$, P<0.00001
Written admission medication	28 (8.4)	15 (3.0)	5 (1.1)	9 (2.9)	$\chi^2=31.5$, P<0.00001

^adf -3.^bNS = Not significant.

hospitals without a college of pharmacy teaching affiliation (see Table I). Only the provision of drug-use evaluation, an activity mandated by the Joint Commission on Accreditation of Healthcare Organizations, did not vary significantly by college of pharmacy teaching affiliation. Five of the fourteen inpatient clinical pharmacy services were available in more than 50 percent of the college of pharmacy affiliated hospitals: drug-use evaluation, inservices or continuing education conducted by pharmacists, adverse drug reaction management, pharmacokinetic consultations, and drug therapy monitoring.

Table II shows the variation in the presence of inpatient clinical pharmacy services when hospitals were assigned to one of four groups of teaching affiliation: (i) affiliation with a PharmD program (may also be affiliated with a Bachelor of Science (BS) pharmacy degree program; (ii) affiliation with a BS pharmacy program only; (iii) affiliation with a health care degree program other than pharmacy such as medicine, nursing, or allied health (termed “nonpharmacy teaching”); and (iv) no affiliation with any health care degree program (termed “nonteaching”). Of the 333 hospitals grouped as PharmD affiliated, 140 were affiliated with a PharmD program only and 193 were affiliated with both a PharmD and BS pharmacy program. However, provision of services did not differ significantly between these two groups which were subsequently combined as the PharmD affiliated hospitals.

With the exception of drug-use evaluation services, provision of all fourteen inpatient clinical services varied statistically among-the four groups of teaching affiliations. For twelve of the fourteen services, the following trend was generally observed: the service was most often provided in hospitals affiliated with a PharmD program, followed by hospitals affiliated only with a BS pharmacy program, followed by the nonpharmacy teaching hospitals, followed by the nonteaching hospitals. This pattern varied only slightly for the other two services: inservice/continuing education and written medication histories.

Eight of the 14 services studied were “patient-specific” clinical pharmacy services. These services generally require

the pharmacist to prospectively apply patient-specific data (gathered through patient interview, exam, chart review, or rounds) to patient care. All eight of these patient-specific clinical pharmacy services were offered in substantially more hospitals affiliated with a PharmD program than in hospitals affiliated with a BS pharmacy program. For example, 82 percent of hospitals affiliated with PharmD degree programs had pharmacists providing pharmacokinetics consultations, whereas 57 percent of BS pharmacy program affiliated hospitals had pharmacist involvement in pharmacokinetics consults. Pharmacokinetics consultation services were still common among hospitals teaching nonpharmacy students (44 percent of hospitals) and hospitals without any health care student education involvement (37 percent of hospitals).

Of the eight patient-specific clinical pharmacy services, five were available in about 50-80 percent of the PharmD affiliated hospitals: pharmacokinetics consultation, drug therapy monitoring, drug therapy protocol management, parenteral/enteral nutrition team, and rounds. These “core” activities in PharmD program affiliated hospitals were only available in 30-60 percent of the BS pharmacy affiliated hospitals. Pharmacists’ participation in rounds clearly illustrates the variation in clinical activities among teaching and nonteaching hospitals. Almost one-half of PharmD affiliated hospitals had pharmacists involved in rounding, versus only 18 percent of BS pharmacy program affiliated hospitals. In nonpharmacy teaching hospitals, pharmacists’ involvement in rounds occurred in eight percent of hospitals; and only three percent of nonteaching hospitals had pharmacists involved in rounds. Pharmacists’ participation in rounds had the second highest statistical association of all eight patient-specific clinical pharmacy services in reducing mortality rates in U.S. hospitals(16). One clinical pharmacy service was rarely offered in hospitals regardless of teaching affiliation: written admission medication histories. It is interesting to note, pharmacists’ provision of written admission medication histories had the highest statistical association of the eight patient-specific clinical pharmacy services with reduced mortality rates in U.S. hospitals(16).

Table III. Teaching affiliation by hospital ownership

Hospital type	Hospital teaching affiliation			
	PharmD (n=333) n (%)	BS Pharmacy only (n=506) n (%)	Nonpharmacy teaching n=451 n (%)	Nonteaching (n=307) n (%)
Nonfederal government (n=253)	45 (13.5)	65 (12.9)	88 (19.5)	55 (17.9)
Nonprofit nongovernment (n=1037)	218 (65.5)	370 (73.3)	266 (59.0)	183 (59.6)
For profit (n=219)	32 (9.6)	45 (8.9)	79 (17.5)	63 (20.5)
Federal government (n=87)	38 (11.4)	25 (5.0)	18 (4.0)	6 (2.0)

^a $\chi^2 = 76.1$, $df = 9$, $P < 0.00001$.

Table IV. Teaching affiliation by hospital size^a

Hospital size	Hospital teaching affiliation			
	PharmD (n=333) n (%)	BS Pharmacy only (n=506) n (%)	Nonpharmacy teaching n=451 n (%)	Nonteaching (n=309) n (%)
Small (n=1149)	145 (44.1)	354 (82.3)	367 (82.3)	283 (94.0)
Medium (n=303)	117 (35.6)	60 (13.5)	60 (13.5)	18 (6.0)
Large (n=126)	67 (20.4)	19 (4.3)	19 (4.3)	—

^a $\chi^2 = 239.0$, $df = 6$, $P < 0.00001$.

Five of the 14 clinical pharmacy services studied are often provided as a departmental activity in a hospital-wide fashion. Three of these hospital-wide services (drug-use evaluation, inservice education, and adverse drug reaction management) were the most commonly provided clinical pharmacy services in hospitals which were affiliated with either PharmD programs or only BS pharmacy programs. Two other hospital-wide clinical pharmacy services, clinical research and poison information, were offered in substantially more hospitals affiliated with a PharmD program than in hospitals affiliated only with a BS pharmacy program; yet these were much less common than the three previously mentioned hospital-wide clinical pharmacy services. Certainly, clinical research activities (with substantial pharmacist involvement such that a pharmacist is likely to be an author or co-author) are more likely to be found in hospitals which have an affiliation with a PharmD program (37 percent of hospitals) than in hospitals affiliated with only a BS pharmacy program (11 percent of hospitals). A similar relationship was observed with drug information activities (which required formalized drug information services but not a physical location called a drug information center), where 42 percent of PharmD program affiliated hospitals offered drug information services versus 23 percent of BS pharmacy program affiliated hospitals.

Among those hospitals with active teaching affiliations, the intensity of educational involvement varied greatly as assessed by the number of students completing clerkships at each hospital. The median number of BS pharmacy students clerking at each institution affiliated with a BS pharmacy program was four with a range from one to 120 (mean 8 ± 13). Seventy-five percent of the hospitals had seven or fewer students per year. The median number of PharmD students studying at each PharmD affiliated hospital was two with a range from one to 150 (mean 10 ± 19). Seventy-five percent of the hospitals had ten or fewer PharmD students each

year. Table III shows the variation in teaching affiliation by the ownership status of the hospital. All pharmacy degree program clerkships were most often conducted in nonprofit nongovernment hospitals (such as a community hospital); followed by more limited involvement with nonfederal government (e.g., state, county, and city) hospitals. For-profit hospitals provided about 10 percent of the hospital affiliations for both the PharmD programs and the BS programs. Federal hospitals provided about 11 percent of the hospital affiliations for the PharmD programs and only five percent of hospital affiliations for the BS programs.

The variation of teaching affiliation by hospital size is shown in Table IV. PharmD programs (alone or with a BS pharmacy program) were likely to be affiliated with any size hospital: small, medium, or large. In contrast, BS pharmacy programs were much more likely to be affiliated with small-sized hospitals than medium or large-sized hospitals.

The educational background of the hospital pharmacy director varied significantly with the hospital's degree program affiliation (see Table V). As the pharmacist teaching involvement progressed from teaching nonpharmacy students, to BS pharmacy students, to PharmD students (teaching intensity), the hospital pharmacy directors were more likely to possess an advanced degree. In those hospitals affiliated with a PharmD program, 69 percent of the directors had an advanced degree (PharmD, MS pharmacy, or nonpharmacy Masters) compared with 54 percent of BS pharmacy affiliated hospitals, 45 percent of nonpharmacy teaching hospitals, and 32 percent of hospitals without any teaching affiliations. Similarly, as teaching intensity increased, the affiliated hospitals were more likely to have decentralized pharmacists than centrally-based pharmacists (Table VI). While the decentralized model of pharmacists' activity predominated in hospitals affiliated with a PharmD degree program, hospitals with other degree affiliations or no teaching affiliations were more likely to have

Table V. Teaching affiliation by pharmacy directors education³

Pharmacy director's education	Hospital teaching affiliation			
	PharmD (n=333) n (%)	BS Pharmacy only (n=506) n (%)	Nonpharmacy teaching n=451 n (%)	Nonteaching (n=307) n (%)
BS Pharmacy (n=792)	102 (30.8)	237 (47.0)	249 (55.6)	204 (67.3)
PharmD (n=240)	90 (27.2)	38 (7.5)	67 (15.0)	45 (14.9)
MS Pharmacy (n=292)	82 (24.8)	119 (23.6)	64 (14.3)	27 (8.9)
Nonpharmacy Masters (n=262)	57 (17.2)	110 (21.8)	68 (15.2)	27 (8.9)

^a $\chi^2 = 150.8$, $df = 9$, $P < 0.00001$.

Table VI. Teaching affiliation by pharmacists' practice model^a.

Type of pharmacy operation	Hospital teaching affiliation			
	PharmD (n=333) n (%)	BS Pharmacy only (n=506) n (%)	Nonpharmacy teaching n=451 n (%)	Nonteaching (n=309) n (%)
Small (n=1149)	145 (44.1)	354 (70.5)	367 (82.3)	283 (94.0)
Centralized pharmacists (n=469)	68 (20.5)	157 (31.1)	151 (33.6)	93 (19.8)
Centralized pharmacists with daily unit visits (n=680)	88 (26.6)	188 (27.6)	220 (48.9)	184 (60.9)
Decentralized pharmacists (n=439)	175 (52.9)	160 (31.7)	79 (17.6)	25 (8.3)

^a $\chi^2 = 199.9$, $df = 6$, $P < 0.00001$.

centrally based pharmacists.

Each hospital's patient case mix or severity of illness was assessed by its case mix index assigned by HCFA. The higher the case mix index, the greater the hospital's proportion of severely ill Medicare patients. Teaching hospitals had more severely ill patients as reflected by a higher HCFA case mix index (Table VII). The mean case mix index was statistically higher for Pharm.D affiliated hospitals than all other hospitals. Similarly, the case mix for BS pharmacy program affiliated hospitals was statistically greater than the case mix for either nonpharmacy teaching hospitals or hospitals without any teaching involvement.

DISCUSSION

This paper describes the characteristics of hospitals affiliated with college of pharmacy teaching programs. By studying the provision of common inpatient clinical pharmacy services, the differences among hospitals with varying teaching programs is apparent. This information can assist both college faculty and hospital pharmacy personnel "benchmark" their clerkships and pharmacy services with other hospitals involved in similar teaching programs. For example, faculty may determine that because five inpatient clinical pharmacy services are offered in 50 percent or more of all hospitals affiliated with any college of pharmacy degree program, that these five services are desirable for hospital affiliation. This data will help both faculty and practitioners articulate the responsibilities assumed by today's hospital-based pharmacist. Some activities are common to many hospitals (such as drug use evaluation, pharmacist provision of continuing education programs, or adverse drug reaction management), therefore, colleges should structure both didactic and experiential courses so that

Table VII. HFCA case mix index by teaching affiliation^a

	Mean \pm SD ^{b,c}
PharmD (n=251)	1.428 \pm 0.27*
BS Pharmacy only (n=435)	1.306 \pm 0.19*, †
Nonpharmacy teaching (n=395)	1.261 \pm 0.17*, †, □
Nonteaching (n=279)	1.192 \pm 0.15*, †, □

^aHFCA Case Mix Index available for 1360 hospitals.

^bOne-way ANOVA preceding Scheffe multiple-pairs comparison of the mean $F_{3,1356} = 78.04$, $P < 0.0001$.

^cValues with like symbols differ significantly at $P < 0.05$.

students gain competence in these pharmacist responsibilities.

PharmD programs, alone or offered in combination with BS pharmacy programs, were affiliated with hospitals which offered more clinical services than hospitals affiliated with only a BS pharmacy program. For example, 82 percent of PharmD affiliated hospitals had a pharmacokinetics service compared with 57 percent of BS pharmacy only affiliated hospitals. When assessing the suitability of hospitals for teaching affiliation, faculty and practitioners should discuss whether such services are present. If a pharmacokinetics service is not offered, perhaps patients' needs are met through other mechanisms such as a clinical pharmacology service or routine provision of pharmacokinetics monitoring by decentralized pharmacists. Alternatively, a "pharmaceutical care" model or patient-focused care model may preclude specific consult services, yet, pharmacists may be actively providing direct patient care(17). Whatever practice model is used, faculty and practitioners should clearly define the opportunities for pharmacy student participation in direct patient care. Together, faculty and practitioners can develop a profile for each affiliated hospital; this profile

can help students select clerkship rotations which develop specific skills. Students should obtain patient care experiences within a variety of settings. For example, students often gain extensive experience in interacting with physicians and nurses during rounds; but rounds are clearly limited to teaching hospitals. Therefore, students who may eventually practice in nonteaching hospitals or the ambulatory arena will need to develop other mechanisms to impact patient care such as pharmaceutical care models, or services such as nutrition support and pharmacokinetics.

Even though most pharmacy teaching programs have been affiliated with nonprofit hospitals, the restructuring of United States health care delivery and the growth of the large for-profit hospital chains suggest that colleges must actively seek teaching affiliations with for-profit hospitals(18). Similarly, as most hospitals are involved in creating mergers, alliances, networks, or systems, colleges will probably be negotiating teaching affiliations with larger health care systems instead of individual hospitals. While these negotiations may be difficult and often conducted at the corporate level (versus the individual pharmacy department level), the opportunity to arrange teaching affiliations with larger health care systems is attractive. The new integrated health care systems share resources, practice methodologies, and offer both ambulatory and acute care teaching opportunities. As colleges negotiate teaching affiliations with health care systems, continuity of care rotations may be realized. The student can participate in caring for patients whether that patient be in the hospital, the clinic, a home care program, a hospice program, a subacute care facility or a skilled nursing facility. Similarly, integrated health care systems may offer a combination of urban and rural health care facilities as well as large and small hospitals.

College faculty seeking teaching affiliations with hospitals should understand the array of pharmacy personnel employed in that institution. When total pharmacy personnel salary costs (pharmacists, technicians, and other pharmacy support personnel) were standardized using total pharmacy personnel salary costs per occupied bed per year, we observed higher pharmacy personnel costs in teaching hospitals than nonteaching hospitals(19). However, after adjusting the pharmacy personnel costs for patients' severity of illness using the HCFA case mix index, the differences were no longer significant(19). The higher pharmacy personnel costs in teaching hospitals were offset by the greater proportion of severely ill patients.

Teaching hospitals are more likely to employ pharmacy technicians and permit pharmacy technicians to perform a greater array of functions(20). Increased use of pharmacy technicians was shown to be associated with increased involvement by pharmacists in the provision of clinical pharmacy services. Several technician functions requiring higher skill levels (more than simply filling floor stock or unit dose carts) were associated with increased pharmacist involvement in direct patient care. Activities such as technicians training other technicians, technicians preparing parenteral nutrition and antineoplastic solutions, technicians compounding medications, and technicians obtaining drug products for decentralized pharmacists potentially indicate systems in place that free pharmacists from technical tasks and potentially redeploy them to clinical activities. College personnel establishing teaching affiliations must consider the entire personnel structure of the hospital and look for indicators of shifting dispensing responsibilities from phar-

macist to technician or automated technology.

When establishing teaching affiliations, faculty should explore the practice philosophy of the director of pharmacy and the written plan for expanding clinical pharmacy services or implementing pharmaceutical care which we found available in 67 percent of college of pharmacy affiliated hospitals. It is the director who often provides the overall leadership for integration of students into daily practice routines. It is often the director who ensures that teaching is an institutional commitment, not just an individual commitment, thus promoting consistency of learning experience despite staffing schedules. Generally, clinical pharmacy services were most common in hospitals where the director of pharmacy had a PharmD, followed closely by directors with a Masters in pharmacy. Hospitals where the director of pharmacy had a BS pharmacy degree had the lowest levels of clinical pharmacy services.

While these associations are interesting, it is important to remember that they do not indicate a cause and effect relationship. Today's pharmacy director may have responsibilities for other departments such as ambulatory care, employee health, materials management or respiratory care. This new "mega director" of pharmacy is likely to view pharmacy as an integrated component of multidisciplinary care rather than a traditional "stand alone" departmental). Flattening of management staffs in many hospitals has created new reporting relationships. The core pharmacy department may be much smaller while unit-based pharmacists involved in direct patient care may report to care team leaders (often nurses and occasionally pharmacists or other health professionals). Integration of pharmacy student clerkships within these emerging multidisciplinary health care delivery models is a challenge for both academics and practitioners.

Previous studies showed that hospitals with college of pharmacy teaching affiliations were more likely to have pharmacists involved in home health care patient management, pharmacists providing clinical services in ambulatory medical clinics, and pharmacists operating outpatient pharmacies(22). The downsizing of inpatient acute care (642 community hospitals closed between 1980 and 1992) and related inpatient pharmacist activities are often accompanied by an increase in ambulatory care(23). This shift in patient care may provide excellent opportunities for pharmacy students to gain practical experience in ambulatory services. Home care offers excellent opportunities for students in: integrating clinical and distributive functions, creating patient care plans, complying with rules and regulations, etc. The Congressional Budget Office predicts that home care spending will quadruple between 1993 and 2000(24). Patients whose therapy depends on drugs (pneumonia, pulmonary and infectious diseases, and various chronic cardiovascular diseases) will more often be cared for through home care services. Because home health care is emerging as a front-end substitution for more costly inpatient acute care, the potential for pharmacy student involvement in home care should be aggressively explored with hospitals and their related health care systems.

LIMITATIONS

The study has several limitations. Survey data were self-reported; no attempts were made to verify the data through field study. Nonresponder bias may have occurred with a response rate of 43 percent, perhaps related to the length of

the survey instrument. Specialty hospitals, such as psychiatric and rehabilitation, were not included in this study as their personnel needs are quite different from acute care hospitals. Statistical significance represents associations only, not cause and effect. Finally, this data was collected in 1992 and provision of some clinical services may have shifted.

CONCLUSIONS AND IMPLICATIONS

This study delineated some of the characteristics common among hospitals actively involved with colleges of pharmacy. Clearly, the array of clinical pharmacy services offered in our nation's pharmacy teaching hospitals is different than that found in nonteaching hospitals. All fourteen clinical pharmacy services studied in this study were offered more often in hospitals affiliated with a college of pharmacy degree program than hospitals without college of pharmacy affiliation. Some services, particularly patient-specific clinical pharmacy services (drug therapy monitoring, drug therapy protocol management, nutrition team, and medication counseling) were offered in 50-100 percent more college affiliated hospitals than hospitals without college affiliation.

This study also showed that clinical pharmacy services are more commonly provided in hospitals affiliated with a PharmD program than hospitals affiliated with a BS pharmacy program. Thus, a student's total clerkship program should be prospectively structured to gain active experience in specific pharmacist responsibilities; scheduling students only on a site basis (hospital, community, ambulatory) may not promote competency in the cadre of responsibilities assumed by a contemporary pharmacist. Patient populations among hospitals of varying teaching affiliation differ. PharmD affiliated hospitals had a higher severity of illness than other hospitals. Differences in patient-case mix, hospital size and ownership, and the pharmacy director's educational background (all observed to be significant in this study) may contribute to different clerkship experiences. Dramatic shifts in health care delivery (emerging integrated health care systems, shift from inpatient acute care to sub-acute care and ambulatory care, patient-focused care with its interdisciplinary teams, flattening of management, and horizontal and vertical integration of pharmacy services) all suggest that colleges need to creatively develop expanded teaching affiliations. The traditional site for much of pharmacy experiential education, the academic medical center, is just as likely to down size and shift resources to the ambulatory arena as are the nonteaching hospitals (25). Student exposure to a diversity of hospitals and health care systems will help students adjust to varying practice models and the differing missions of teaching and nonteaching hospitals and systems. Hospitals, with their expanding roles in ambulatory care and alternative distribution channels offer exciting opportunities for educating tomorrow's pharmacist.

Am. J. Pharm. Educ., **59**, 248-255(1995); received 3/7/95, accepted 5/9/95.

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APPENDIX

Hospital Size

Small hospital: A hospital with an average daily census (ADC) of <200.

Medium-sized hospital: A hospital with an ADC of 200-399.

Large-sized hospital: A hospital with an ADC of > 400.

Hospital Teaching Affiliation

PharmD affiliated: A hospital affiliated with a college of pharmacy doctor of pharmacy [PharmD] degree program (may also be affiliated with a bachelor of science [BS] pharmacy program).

BS pharmacy only affiliated: A hospital affiliated with a college of pharmacy BS pharmacy degree program.

Nonpharmacy teaching hospital: A hospital affiliated with a school of medicine, school of nursing, allied health-care program, or MS or MBA degree program but not with a college of pharmacy.

Nonteaching hospital: A hospital not associated with a college of

pharmacy, school of medicine, school of nursing, allied health-care program, or master of science (MS) or master of business administration (MBA) degree program.

Pharmacists' Practice Model

Decentral pharmacists: Decentralized pharmacists with dispensing functions supported mostly by a central pharmacy, satellite pharmacies, or mobile carts.

Central pharmacists: Centralized pharmacists who may occasionally visit patient care units but not on a daily basis.

Central pharmacists with ward visit: Centralized pharmacists who visit the patient care unit at least once daily.

Pharmacy Director's Education

BS: Pharmacy directors with a BS pharmacy degree only.

MBA/PhD/nonPharmacy Masters: Pharmacy directors with an MBA degree or another nonpharmacy masters degree or a PhD degree who may also have completed a BS pharmacy degree.

Masters in pharmacy: Pharmacy directors who have an MS degree in pharmacy who may also have completed a BS pharmacy degree or a PharmD degree.

PharmD: Pharmacy directors who have a PharmD degree who may also have a BS degree.

Hospital Ownership

Government, nonfederal: State, county, city, city-county or hospital district or authority owned hospitals.

Nongovernment not-for-profit: Church operated or other hospitals.

Investor-owned (for-profit): Individual, partnership, and corporation owned hospitals.

Government, federal: Air Force, Army, Navy, Public Health Service, Veterans Administration, Public Health Service Indian Service or Department of Justice owned hospitals

Council of Teaching Hospitals of the Association of American Medical Colleges

Membership in the Council is limited to teaching hospitals that sponsor or participate to a substantial degree in at least four approved active medical residencies. In 1993, there were 388 member hospitals including 72 Department of Veterans Affairs medical centers and 61 university-owned teaching hospitals(25). Most of the nonfederal Council teaching hospitals were nonprofit institutions sponsored by tax-exempt, nonsectarian, or church-related organizations. The remaining Council hospitals are either state, city, or county owned. All have affiliations with medical schools.

Patient-Specific Clinical Pharmacy Services

Routine monitoring of drug therapy. (Concurrent) Patient's medical record is reviewed by the pharmacist and verbal or written follow-up is provided when needed. Do not include if only drug orders are reviewed.

Pharmacokinetic consultations. Provided only if at a minimum the drug, serum level, and patient's medical record is reviewed by the pharmacist and a verbal or written follow-up is provided when necessary.

Counseling of patients on medications either during hospitalization or at time of discharge. Do not include if counseling involves solely review of label directions.

Parenteral/enteral nutrition team. Provided only if pharmacist at a minimum reviews patient's medical records or provides written or verbal follow-up if needed.

Protocol Management. Provided if pharmacists determine medical regimen based on physician request. For example: aminoglycoside or heparin dosing per pharmacy.

Pharmacist rounds with medical team at least 3 days/week actively providing specific input.

Admission medication histories are done (written).

Cardiopulmonary arrest. Provided only if a pharmacist is an active member of the CPR team attending most arrests when the pharmacist is present in the hospital.

Adverse drug reaction management. Provided if pharmacist evaluates potential adverse drug reaction while patient is hospitalized and appropriately follows through with physician.

Hospital-Wide Clinical Pharmacy Services

Drug use-evaluation/quality assurance is routinely performed by pharmacists and the results are formally presented to medical staff or the appropriate committee(s).

Staff inservices continuing education. Pharmacist provides continuing education to fellow employees (MD, RN, RPh, etc.) on a scheduled basis at least four times yearly.

Drug information. Provided only if a formal drug information service with specifically assigned pharmacist is available for questions.

Poison information. Provided only if a pharmacist is available to answer toxicity/overdose questions on a routine basis with appropriate resources.

Clinical Research is performed by pharmacist either as principal investigator or co-investigator. Pharmacist is likely to be (co)author on a published paper. Do not include for activity limited to investigational drug distribution and record keeping.