2001/2002 Annual Report: Hospital Pharmacy in Canada Survey

Medication Incidents

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HOSPITAL PHARMACY ANNUAL REPORT
EDITORIAL BOARD

Foreword

D. Terrance McCool

Eli Lilly Canada Inc. is pleased to present the results of the 14th Hospital Pharmacy in Canada Survey on the Hospital Pharmacy in Canada website, www.lillyhospitalsurvey.ca, the second Canadian survey to be presented to you with online convenience.

Lilly, the Editors and the users of the Annual Report would like to thank all of the hospital pharmacists in Canada who responded to this year's survey. The names of their hospitals appear in our Respondent Recognition section. Our special thanks to the Regional Coordinators who assisted us and helped us to achieve over a 50% response rate. The data presented in the 2001/2002 edition of the Canadian Hospital Pharmacy Report is your data, as submitted and compiled by The Global Chapter - Research, Communications and Sales Support Services, Inc. *

We would like to thank our 2001/2002 Editorial Board - Ron McKerrow, Steve Long, Kevin Hall, Pegi Rappaport, Jean François Bussières, Janet Harding, Patricial Lefebvre, Neil Johnson and Nancy Roberts for their personal effort and commitment to produce this report.

Management information can be a valuable tool in both decision-making and planning in pharmacy and administration. It is our hope that the information in the report is helpful and contributes to effective decisions in hospitals, professional associations and in governments.

Yours truly,

D. Terrance McCool
Vice-President, Corporate Affairs
Eli Lilly Canada Inc.

* The Editorial Board comments are based on an analysis of this data. The views expressed in the text do not necessarily represent those of Eli Lilly Canada Inc.

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The Editors would like to extend their gratitude to the following people who assisted in enhancing the response rate by personally contacting hospital pharmacists to follow up once the survey was sent:

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Data Collection Methodology
Paul Oeltjen

A telephone survey of Hospital Pharmacies in Canada was conducted in order to get the most recent e-mail addresses of Directors of Pharmacy and Hospital CEOs in Canada (or the mailing address if no e-mail was available). An estimate of the number of acute beds and the total number of beds was also obtained. The Hospital Pharmacy in Canada (HPC) survey was then announced on May 10, 2002, in e-mails to Directors of Pharmacy and CEOs of hospitals with an estimated bed size greater than 100 (and more than 50 acute beds). A second e-mail letter was send only to the Directors on May 14, 2002. This letter contained the respondent identification and the password required to log on to the survey web site and instructions for completing the survey. Respondents who had not completed the on-line survey received weekly reminders (starting about 4 weeks after the initial mailing of instructions).

Directors with responsibility for more than one hospital pharmacy (in a multi-site health organization) had the option to request additional passwords in order to complete separate surveys for hospital pharmacy departments operating independently of each other and where pharmacy data were not consolidated.

This year there were two passwords: a “director password” to be used by the director of pharmacy and a “data entry password” that could be used by the director to delegate the data entry without losing control of the survey completion process.

Online survey completion was interactive: If an answer required that certain sections be skipped, the on-line program presented a modified version of the questionnaire where it was not possible to enter responses to the questions in the skipped sections.

After data entry was completed, the Director of Pharmacy completed a section of the questionnaire that was only accessible by using the "Director password". In this section the director provided contact information, approved the completed questionnaire and "locked" the questionnaire data entry process so that no further modification of the data was possible.

Nine hospital pharmacies preferred to return completed paper copies of the questionnaires. Staff of the research firm “The Global Chapter” entered the data for these hospitals using the on-line survey program.

Questionnaires with at least 25% of questions completed by July 21, 2002 and with answers to those questions required to classify the hospital (e.g., teaching status and bed size) were included in the analyses (representing a total of 123 hospital pharmacies).

Introduction – Focus on Medication Incidents

Ron McKerrow

The Canadian healthcare landscape has continued to change dramatically since the last report two years ago. A number of provincial studies have been published and the report of the Commission on the Future of Health Care in Canada (the Romanow Commission report)[1] has recently been released. The demands for healthcare services have increased and are expected to continue to increase as the Canadian population ages, while funding to support these services has declined or remained unchanged. A review of Canadian newspapers suggests that access issues are prevalent across the system, as evidenced by the length of waiting lists and the frequency of surgical cancellations. Throughout these changes, it is clear that the Canadian public continues to regard healthcare as one of the most important issues for Canadians.

The cost of medications in Canada is increasing faster than any other part of the healthcare system. Medication has recently replaced physicians as the second highest cost category in the Canadian healthcare system. The percentage of the healthcare dollars spent on hospitals has been declining for the past 10 years, but despite this, the demand for pharmacy services continues to increase. This increase coupled with a shortage of pharmacists has lead to a chronic undersupply. This report indicates that there were 228 vacant hospital pharmacist positions on March 31, 2002, the highest ever recorded in this survey.

In 1999 the Institute of Medicine in the United States published To Err is Human[2], which challenged the healthcare system to reduce error and specifically to improve the safety of medication use. This report, and others, have raised the awareness of health professionals and the general public to concerns regarding patient safety as well as the opportunities for improvement. This year's survey collected information on medication incident reporting systems and error reduction strategies. Janet Harding and Patricia Lefebvre indicate that their goal in collecting this information is to provoke further review of medication use systems in Canadian hospitals and decrease the probability that a patient will be harmed by a medication incident. Unit dose medication delivery, centralized intravenous additive programs, pharmacy generated computerized medication administration records and progressive clinical services have demonstrated that pharmacists are leaders in improving the safety of the medication use system. The opportunities for leadership continue as evidenced by the information presented in our feature article. This information should incite pharmacists to accept the challenge to work collaboratively with other healthcare providers to ensure our medication use systems are as safe as possible.

Neil Johnson's review of human resource management in Canadian hospital pharmacy is insightful. This year's report illustrates the growing problem of human resource shortages in Canadian hospital pharmacy and shows that these shortages have given rise to significant increases in compensation and a more focused effort on the part of employers to implement strategies to retain and recruit skilled pharmacists. The shortage of skilled workers is likely to continue to grow, further compromising the ability of hospital pharmacists to deliver comprehensive and high quality patient orientated pharmacy services.

Although drug distribution systems for inpatients do not change rapidly, Steve Long has effectively outlined a number of significant changes. The use of automated unit dose dispensing technology has almost doubled since the last report. The number of satellite pharmacies has significantly increased and technicians checking technicians in the preparation of medications has become common practice. In addition, Steve identifies trends in drug purchasing including the rapid increase in drug costs. Respondents indicate that costs have increased almost $1.5 million since the 1999/2000 annual report, with minimal change in hospital size, patient days or clinic visits.

Clinical pharmacy services, described by Jean-François Bussières as the heart and the future of the profession, continue to account for less than 40% of a pharmacist's practice time. The 2001/2002 report indicates that the value of clinical pharmacy services continues to be recognized, since clinical pharmacy services continue to grow both in the hours of clinical services and the variety and complexity of services provided.

It has been four years since drug information services were last reviewed in this report. As part of the 2001/2002 survey, new questions were included to evaluate the resources dedicated to drug use evaluation services as well as non-pharmacist support for both drug information and drug use evaluation services. Nancy Roberts reviews these data and summarizes the key findings.

In the last two hospital pharmacy reports, the results of a new approach to developing benchmark indicators for pharmacy departments in Canada were first reported. Dr Kevin Hall has analyzed data from large acute and specialty hospitals and has used subset analysis to improve the usefulness of data for inter-facility comparison. Dr Hall's article shows the data provided in the program based benchmarking survey for 2001/2002 validates the methodology that was used in the previous two benchmarking surveys. The results demonstrate that increases of both staffing and drug costs have occurred over the past two years and a number of program specific pharmacy indicators for both staffing and drug costs are provided.

Through the publication of reports and through national meetings bringing together pharmacy leaders from across the country to identify and discuss emerging trends in hospital pharmacy practice, the editorial board brings a historical perspective of where pharmacy has been as well as a look to the future to predict where hospital pharmacy practice is heading. We sincerely hope that the information contained in this report will provide a useful tool to assist pharmacy managers in their practice.

References

[1] Building on Values: The future of Health Care in Canada-Final Report, Commissioner Roy J Romanow Q.C. Nov 2002, http://www.healthcarecommission.ca
[2] Kohn LT, Corrigan JM, Donaldson MS, eds. To Err is Human: Building a Safer Health System. Washington, DC: National Academy Press; 1999.

Demographics

Ron McKerrow

The 2001/2002 response rate was significantly higher than the last survey at 57% (123/217). The number of respondents increased from 115 to 123 while the number of surveys sent fell from 273 to 217, likely due to consolidation of hospitals and increased regionalization. The mix of facilities was similar to past years; 58% of all respondents were from non-teaching facilities and 42% were from teaching facilities. The number of respondents from multi-site health organizations increased slightly from 57% to 60%, indicating the effects of regionalization in health centers across Canada have stabilized. The different provincial approaches to health system restructuring were reflected in the significant regional variability in respondents from multi-site health organizations, with British Columbia, the Prairies, and Atlantic Canada at 85% and central Canada at 45%. The number of sites managed as a collective unit averaged 5.7, and ranged from 2 to 20.

The response rate by province is illustrated in Figure A-1. Ontario, Saskatchewan and Nova Scotia showed a significant increase in response rate while other provinces had a response rate similar to the last survey. The response rate would have been significantly lower had the editorial board not extended the response deadline. Many pharmacy managers indicated that extreme workload pressures and lack of available information either delayed their responses or prevented them from responding.

Hospital demographic information presented in Table A-1 represents the average of reported data from hospitals with a total of 100 beds or more and at least 50 acute care beds. These data were consistent in sample size and demographic indicators when compared to previous years. There has been consistency in the acute care data over the past two reports; however, this year these data show an increase in almost every category. The number of beds, annual admissions, occupancy rate, patient days, clinic/medical day unit visits, emergency department visits, operating room caseload and surgical/day unit caseload have increased. Length of stay has decreased by 7% when compared with 2001/02 report – from 7.6 days to 7.1 days. The reduction in length of stay has been solely from teaching hospitals, which have reduced length of stay from 8.7 days to 7.5 days.

In non-acute care the number of beds and annual admissions have decreased, while occupancy rate and patient days show a slight increase. The length of stay in these facilities has been reduced from 230 days to 194 days.

Pharmacy demographic data is provided in Table A-2.

Figure A-1. RESPONSE TO THE SURVEY BY PROVINCE
2001/02

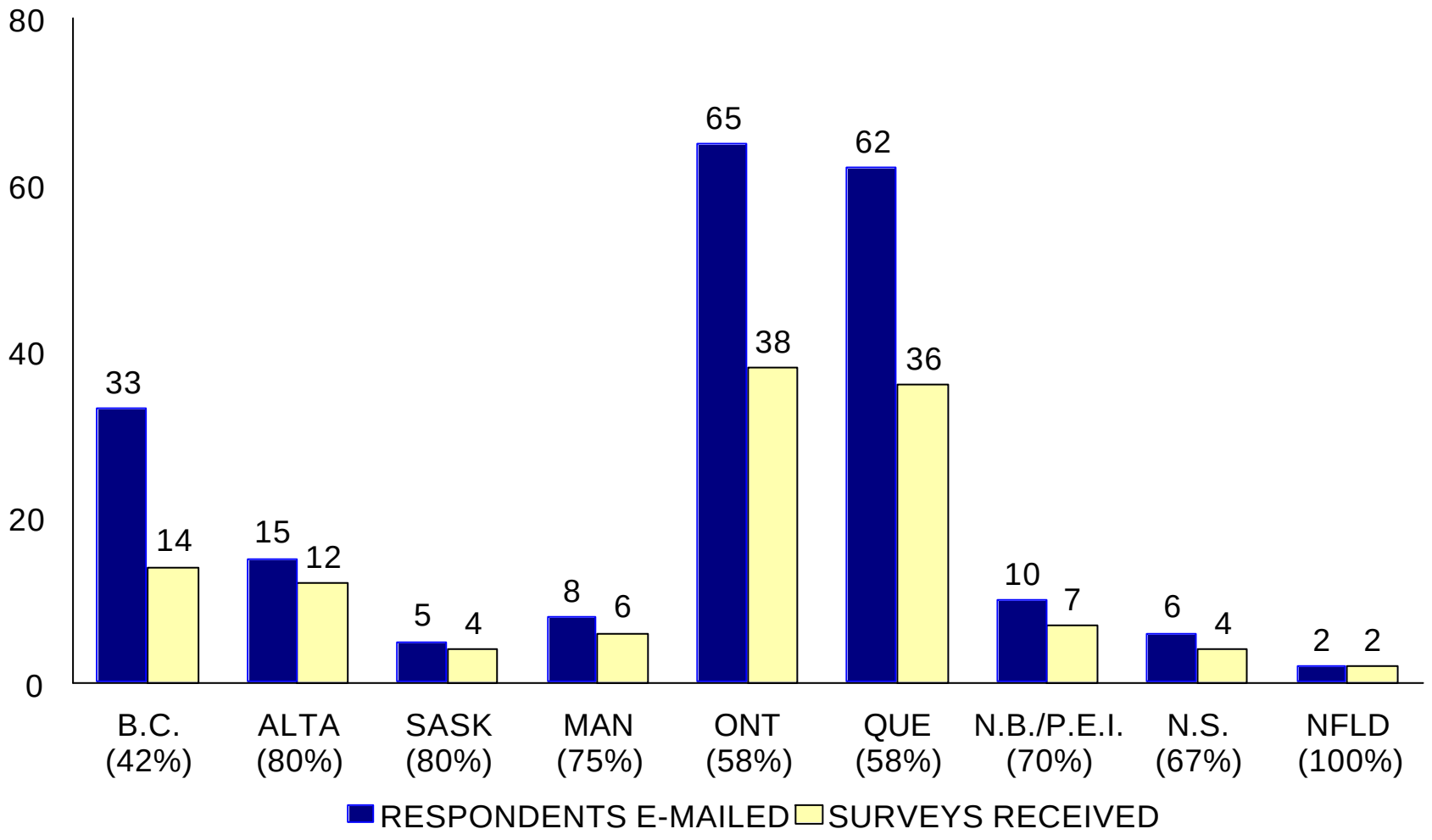

Table A-1. Hospital Demographic Data 2001/02

Hospitals (n=)	Acute Care		
	All (123)	Teaching (52)	Nonteaching (71)
Number of beds	312	460	204
Annual admissions	13,389	18,349	9,613
Occupancy rate	87%	86%	87%
Patient days	96,663	138,828	65,658
Length of stay (days)	7.1	7.5	6.8
Clinic/Medical Day Unit Visits	120,429	203,865	56,021
Emergency Department Visits	51,634	60,847	45,308
Operating Room Case Load	7,304	10,910	4,900
Surgical/Day Unit Case Load	7,723	8,677	7,116

Hospitals (n=)	Nonacute Care		
	All (92)	Teaching (33)	Nonteaching (59)
Number of beds	141	145	139
Annual admissions	438	331	499
Occupancy rate	93%	93%	93%
Patient days	51,041	51,779	50,652
Length of stay (days)	194	177	203

Table A-2. Pharmacy Department Data 2001/02

Hospitals (n=)	All (123)	Bed Size			Teaching Status	
		100-200 (29)	201-500 (66)	> 500 (28)	Yes (52)	No (71)
Pharmacy hours of operation	82	63	85	96	98	71
Satellite dispensaries	63	7	34	22	42	21
	51%	24%	52%	79%	81%	30%
• Types:						
Operating Room	5	0	2	3	5	0
Critical Care	14	1	6	7	13	1
Oncology	47	6	25	16	30	17
Other	23	1	8	14	21	2
Program Management						
Yes – Total	40	5	20	15	20	20
	33%	17%	30%	54%	38%	28%
Yes – Partial	18	3	9	6	10	8
	15%	10%	14%	21%	19%	11%
Pharmacists' salary paid by: (n=58)						
Pharmacy	43	7	22	14	21	22
	74%	88%	76%	67%	70%	79%
Program	1	-	1	-	-	1
	2%		3%			4%
Shared	13	1	6	6	8	5
	22%	13%	21%	29%	27%	18%
Pharmacists' reporting responsibility: (n=58)						
Pharmacy	41	7	21	13	19	22
	71%	88%	72%	62%	63%	79%
Program	1	-	-	1	1	-
	2%			5%	3%	
Shared	15	1	8	6	9	6
	26%	13%	28%	29%	30%	21%
Pharmacy Space (square feet)						
• Main Pharmacy (n=91)	2,006	1,052	1,842	4,206	2,599	1,652
• IV Room(s) (n=87)	460	226	432	924	731	286
• Stock Room(s) (n=75)	805	414	651	1767	1249	492
• Satellites (n=38)	724	252	542	1,376	943	247
• Offices (n=82)	638	293	625	1,224	1,035	397
• Other (n=38)	949	234	693	2,928	1,361	579
Total (n=115)	5176	2,020	4,217	11,467	8,242	3,056

Clinical Pharmacy Services

Jean-François Bussières

Clinical pharmacy services represent one of the five major categories of pharmacy practice. Many pharmacists regard clinical services as the heart and the future of the profession, however, distribution, teaching, research and non-patient care services still account for more than 60% of the pharmacist's practice time. (See Table F-3 in Human Resources section.)

In 2001/2002, the respondents reported that the average time spent by pharmacists in clinical services was 39%, compared to 38% in 1999/2000, and 9% higher than the 30% reported in the US[1] . The average of reported percentage of time spent by pharmacists in clinical activities was shown to vary according to teaching status (45% in teaching versus 35% in non-teaching hospitals) and region (47% in the Prairies, 42% in Quebec, 37% in Ontario and British Columbia, 31% in the Atlantic provinces). Although it is difficult to establish a link between the systems of distribution and the practice of clinical pharmacy, respondents providing unit dose distribution systems and IV admixture services to = 90% of patients, reported a higher average percentage of time spent by pharmacists in clinical services (n = 29, 47%) versus hospitals with traditional drug distribution (n = 32, 37%).

Even though reported pharmacy staffing has increased by nearly 30% over the past four years, (from 0.57 paid hours/acute patient day in 1997/98, to 0.68 in 1999/2000 and to 0.74 in 2001/2002), the proportion of time spent in clinical activities only increased from 33% in 1997/98 to 39% in 2001/2002. It does not appear that delegation to technicians, and utilization of automation, have been implemented to the full potential and the reported shortage of pharmacists may continue to limit the growth of clinical activities in the future.

Profile of outpatient clinical pharmacy services

In 2001/2002, outpatient clinical pharmacy services were reported in at least one sector by 76% of respondents, compared to 78% in 1999/2000. For the respondents reporting the implementation of outpatient clinical pharmacy services, an average of four outpatient clinical pharmacy services were offered (range 1-10) with an average of 2.32 FTE compared to 1.66 FTE in 1999/2000. The number of outpatient clinical pharmacy services varied across the regions with 3.3 in the Prairies and the Atlantic provinces, 4 in Ontario, 4.1 in British Columbia and 4.5 in Quebec. The number of respondents reporting FTEs for each individual service ranged from 5 to 56, with the services most commonly reported being haematology-oncology, emergency room, DVT/anticoagulant, diabetes, renal/dialysis and infectious disease/aids. It is difficult to identify trends from 1999/2000, as the sample size varies, with a very low number of respondents in some sectors. The number of outpatient clinical pharmacy services and resources allocated (FTE) in 2001/2002 are reported in Table B-1. The average of number of FTE is calculated on the base of respondents reporting at least 0.01 FTE.

Clinical pharmacy resources should be allocated based on established criteria such as patient need, volume of activities, type of drugs used, etc. Based on the annual number of patient visits reported by respondents, a ratio of FTE pharmacists/10,000 visits for each sector was explored, when both volumes of activities and FTE were reported. Results demonstrate a large variance that might be explained by several factors; for example, clinical pharmacists would not be required to see every patient in an ambulatory clinic. The ratios calculated were based on a small number of respondents in many cases and further information of the level of resources required based on volume of activities would enhance internal benchmarking and resource planning. Medians were preferred to means. The median ratio of FTE/10,000 visits was 0.11 ± 0.08 for all sectors. Ratios were in decreasing order (n, median FTE ± SD) : DVT/anticoagulant (n = 7, 7.19 ± 20.99), cardiovascular/lipid clinical services (n = 6, 3.29 ± 4.23), infectious disease /AIDS (n = 5, 3.4 ± 3.64), asthma /allergy (n = 3, 1.39 ± 57.18), mental health (n = 7, 1.28 ± 0.75), geriatric

day care (n=4, 1.22 ± 1.6), haematology-oncology (n =17, 1.21 ± 14.89), transplantation (n = 3, 0.39 ± 0.23), diabetes (n = 10, 0.38 ± 1.68), emergency room (n = 51, 0.03 ± 0.08).

Profile of inpatient clinical pharmacy services

In 2001/2002, 73% of respondents reported FTE for inpatient clinical pharmacy services compared to 92% in 1999/2000. The apparent reduction could be explained by the pharmacist shortage and/or the unavailability of data for some respondents. Also, due to differences in the questionnaire design, the results may not be completely comparable. Respondents reporting FTEs for inpatient clinical pharmacy services reported an average of 5.7 inpatient clinical pharmacy services offered (range 1-13) with an average of 6.66 FTE compared to 4.46 FTE in 1999/2000. The number of inpatients clinical pharmacy services varied across the regions with 4.6 in Quebec, 5.1 in the Atlantic Provinces, 5.4 in the Prairies, 6 in British Columbia and 7.4 in Ontario. The number of inpatient clinical pharmacy services and resources allocated (FTE) in 2001/2002 are reported in Table B-2. The average of number of FTE is calculated on the base of respondents reporting at least 0.01 FTE. It is difficult to identify trends when comparisons are made to 1999/2000 survey results, as the mix and number of respondents varies. The specific services for which FTE's were most commonly reported were adult general medical units, adult surgical units, adult intensive care units, geriatrics/LTC units, adult mental health units, pediatric general medical units, and adult haematology-oncology units.

As with outpatient services, inpatient clinical pharmacy resources should be allocated based on established criteria. Based on the annual number of patient days reported by respondents, a ratio of FTE pharmacists/10,000 patient days for each service was calculated, when both volumes of activities and FTE were reported. Results demonstrate a large variance and the median ratio of FTE/10,000 patient-days was 0.49 ± 0.38 for all services. Ratios were in decreasing order (n, median FTE ± SD) : pediatric intensive care units (n = 5, 2.93 ± 0.65), pediatric haematology-oncology units (n = 4, 2.56 ± 1.09), adult intensive care units (n =36, 1.57 ± 0.31), pediatric surgical units (n = 5, 1.4 ± 2.1), adult haematology-oncology units (n = 11, 1.29 ± 0.68), pediatric mental health units (n= 4, 0.99 ± 0.28), general medical units (n = 19, 0.83 ± 0.5), adult general medical units (n = 43, 0.53 ± 0.34), adult mental health units (n = 29, 0.52 ± 0.37),adult rehab units (n = 15, 0.48 ± 0.57), adult surgical units (n = 38, 0.45 ± 0.31), ob-gyn units (n = 18, 0.25 ± 0.2), geriatrics/LTC units (n = 24, 0.26 ± 0.72).

Pharmacist staffing, distribution systems and clinical pharmacy practice models

The reported average pharmacist staffing for clinical services was 2.32 FTE for outpatient areas and 6.64 FTE for inpatient areas, giving a combined total of the averages of reported inpatient and outpatient staffing for clinical services of 8.96 FTE per hospital. The figures vary according to bed size (3.24 FTE in 100-200 beds, 7.19 FTE in 201-500 beds and 17.28 in >500 beds), teaching status (12.95 FTE in teaching hospitals vs. 5.21 FTE in non-teaching hospitals) and the presence of pharmaceutical care model (9.04 FTE if implemented vs. 4.28 if not implemented).

Upon review of the relationship between clinical pharmacist staffing and drug distribution systems, the average of reported clinical pharmacist FTE was higher in hospitals with unit dose systems (2.65 FTE in outpatient and 8.61 FTE in inpatient) than in hospitals with a traditional drug distribution system (2.27 FTE in outpatient and 4.12 FTE in inpatient). Further statistical analysis could be conducted to identify the relative importance of each element affecting clinical pharmacist staffing.

Participation of pharmacists in clinical activities

Table B-3 provides information on clinical pharmacy activities and documentation. Respondents reported on average a higher percentage of regular rounds with nurses (62% in 2001/2002 compared to 45% in 1999/2000). The difference could be explained by this years' lower weight of

respondents from Quebec, where rounds with nurses were reported less frequently (17%, 6/36). There was an increase in the average of respondents reporting admission histories (64 % in 2001/2002 compared to 53% in 1999/2000), regular rounds with physicians (61% compared to 55%) and pharmacokinetic dosing (88% compared to 84%).

These data show that hospital pharmacists continue to work in collaboration with nurses and physicians to provide direct patient care from patient admission through to discharge in a majority of hospitals across the country. The data reported captures the prevalence of clinical activities but not their level. The total impact of the pharmacist shortage in Canada cannot be measured in this section, as respondents shared the tendency was to reduce services rather than not provide them. Larger hospitals, teaching hospitals and hospitals that provide pharmaceutical care to at least some of their patients reported a higher proportion of clinical activities in select areas.

Eighty percent of respondents reported documentation of interventions. Partial documentation was reported by 54% (67/123) of respondents and documentation for more than 90% of the cases was reported by 26% (32/123). For hospitals reporting the documentation of their interventions, it occurred in medical records (81%), manual pharmacy records (56%), and computerised pharmacy records (53%).

Respondents continued to report a higher number of interventions/year, increasing from an average 2,749 in 1992/93 to 8973 (SD ± 12 534 – range from 0 to 60,000) in 2001/2002. This trend could be related to mergers and regionalization, as the average number of acute and non acute care beds increased from 333 in 1995/96 to 453 in 2001/2002. The rate of intervention documentation increased from 0.44 interventions (both pharmacokinetic or therapeutic) per admission in 1997/98 to 0.53 in 1999/2000 and 0.60 in 2001/2002. This ratio does not appear to be influenced by teaching status or bed size.

The average of reported number of interventions/pharmacist FTE was 571 (SD ± 568) in 2001/2002 compared to 418 in 1999/2000. There are large variations of interventions/pharmacist FTE among regions in the country (British Columbia – 221, Prairies - 446, Ontario – 760, Quebec - 749, Atlantic - 382). This does not seem to be explained by the pharmacist shortage, which is similar between regions, or by staffing, as Quebec had a low 0.68 paid hours/acute patient day compared to Ontario (0.82), Prairies (0.78) or British Columbia (0.75).

Clinical Practice models

Clinical pharmacy practice has evolved through a combination of practice models. Pharmaceutical care is defined as the responsible provision of drug therapy for the purpose of achieving definite outcomes. The process of pharmaceutical care includes designing, implementing and monitoring a therapeutic plan that involves the identification of potential or actual drug-related problems, their prevention and resolution. Traditional clinical pharmacy services are defined as a variety of clinical pharmacy services related to a specific drug, a specific pharmaceutical expertise or a targeted approach that will maximise a specific outcome for a patient (e.g. pharmacokinetic services, total parenteral nutrition (TPN) services).

Traditional clinical pharmacy services were reported to be utilized to fulfil the needs of some patient populations by 89% of respondents (Table B-4), a rate similar to that reported in 1995/96. The provision of pharmaceutical care was reported by 75 % of respondents, up from 66% in 1999/2000. Coexistence of both models, with the current pharmacist resource situation, is inevitable. The resources required to provide pharmaceutical care are extensive and only 2 % of respondents who used the pharmaceutical care model (two hospitals) reported that the pharmaceutical care model was offered to more than 90% of patients.

Respondents from hospitals reporting traditional clinical pharmacy services reported that an average of 57% of beds (SD ± 27, range 2% to 100 %) were covered utilizing this model in 2001/2002 versus 52% in 1999/2000. For hospitals reporting pharmaceutical care services,

respondents reported that an average of 33% (SD ± 23 – range 1% to 100%) of beds were covered using this model Sixty-eight percent of all respondents reported that some patients did not receive any patient oriented clinical services in their institution (for 31% of their beds – SD ± 23 – range 1% to 100%) a decrease from 83% reported in 1999/2000.

Seamless care

Seamless care is defined as the desirable continuity of care delivered to a patient in the health care system across the spectrum of caregivers and their environments. Pharmacy care is carried out without interruption such that when one pharmacist ceases to be responsible for the patient's care, another pharmacist or health care professional accepts responsibility for the patient's care. In 2001/2002 31% of all respondents had established a policy for seamless care, a response similar to the percentage reported in 1999/2000.

For hospitals providing seamless care, respondents reported that the service was provided to an average of 15% of patients (range 1 to 60) in 2001/2002, compared to 11% reported in 1999/2000. Eighty-two percent provided seamless care on a prospective basis and 66 % on request. Respondents reported that the information provided was directed towards community pharmacists (92%), family physicians (68%), home care providers (58%) or home care centres (50%). The information provided included medications at discharge (97%), relevant drug monitoring parameters and lab values (79%), medications discontinued during hospital stay (71%), care plan information (58%) diagnosis (58%). Thirty four percent of respondents indicated that the seamless care documentation form could also serve as a prescription. A higher percentage of respondents who had adopted the pharmaceutical care model reported the development of a seamless care policy, compared to respondents with traditional clinical services (38% vs. 6%).

Hand-held devices

Fifty-two percent of respondents reported the use of hand-held devices in their clinical practice (Table B-5). The technology appeared to be more popular in larger institutions, where 68% of respondents reported use of these devices. For the respondents reporting the use of hand-held devices, the main uses indicated were to consult clinical databases and to manage mail, agenda and tasks. Unfortunately, there were few cases (n = 6) reported where the devices were interfaced with pharmacy software.

Evaluation of clinical pharmacy services

As pharmacy practice evolves, prospective evaluation of clinical pharmacy services should be conducted, not only at a research level, but also on an operational level. Twenty percent of respondents evaluated the provision of direct patient care services through an audit of clinical activities (Table B-6), a rise from 13% reported in 1999/2000. Evaluation of clinical pharmacy services is conducted more often in teaching hospitals (29 %) than non-teaching hospitals (13%).

For hospitals conducting evaluation of clinical pharmacy services (n = 24), respondents reported that the evaluation was performed by peers/other pharmacists (75%), others (50%) and physicians (21%). The methods of evaluation included retrospective chart review (67%), direct observation (50%) and self-evaluation by pharmacists (42%). The aspects that were evaluated included documentation (79%), competency assessment (58%), implementation of objectives and monitoring plan (54%), patient assessment (46%), and patient counselling and understanding of information (46%). No significant changes from 1999/2000 data were observed. The respondents who evaluated services reported that the percentage of pharmacists evaluated was 41% (SD ± 33 %) and that results of the evaluation were shared with pharmacists (79%), professional practice/quality of care committee (21%), multidisciplinary care team (4%) or others (33%).

A recent quantitative evaluation of randomised trials on counselling, education and other clinical services was published[23] The American Society of Health System Pharmacists has published for reference a useful handbook on job skills and evaluation, and provides annual updates.[4]

Prescribing rights

In 2001, the Canadian Society of Hospital Pharmacists (CSHP) adopted a Statement on Pharmacist Prescribing,[5] based on a collaborative prescribing model. The statement supports a co-operative practice relationship between pharmacists and physicians and suggests that " *In an ideal collaborative practice, the physician will diagnose and make initial treatment decisions for the patient and then the pharmacist will select, initiate, monitor, modify, continue and discontinue pharmacotherapy, as appropriate, in order to achieve the desired patient outcomes. In this collaborative practice model, both the physician and the pharmacist share in the risk and responsibility for the patient outcomes achieved.*"

At the same time, CSHP also released An Information Paper on Pharmacist Prescribing within a Health Care Facility.[6] This information paper observes that *"In the traditional model of health care, physicians have the authority to prescribe medications, order laboratory tests and conduct or supervise procedures consistent with a patient's diagnosis. More recently, prescribing privileges have been extended to other health care professionals..... Various levels of prescribing authority for pharmacists are being examined and implemented in a number of provinces (e.g. specially instructed and certified pharmacists prescribing post-coital contraception)."*

Fifty-four percent of respondents reported that professionals, other than physicians and dentists, had authority to prescribe drugs (independent and dependent) in the hospital. (Table B-7) Approval of prescribing rights for other professionals was most common in teaching hospitals (69%) vs non teaching hospitals (42 %), and hospitals with more than 500 beds (75%).

Respondents identified pharmacists (34% of all respondents), nurse practitioners (24%), midwives (23%) and other professionals (9%) as groups having prescribing rights. Only 6% (7/123) of respondents (in 4 provinces) reported that pharmacists' prescribing rights had been authorized by legislation. Seventeen percent of all respondents indicated nurses prescribing rights had been authorized by legislation.

The Boards and committees involved in the hospital-specific approval process to grant other professionals with a right to prescribe drugs were identified as the medical advisory board (88%), the P & T Committee (68%), the hospital board of directors (27%) and the affiliated universities (5%).

Independent prescribing usually implies that the prescribing practitioner is solely and legally responsible for patient outcomes. Dependent prescribing suggests that the prescribing practitioner has obtained a delegation of authority from an independent prescribing professional. In most cases, dependent prescribing refers to prescribing according to a protocol. Of hospitals where professionals other than physicians and dentists prescribed drugs, pharmacists were reported to have dependent prescribing authority for new therapies by 20%, dependent prescribing for dosage adjustments by 56% (mainly for antiemetics and chemotherapy) independent prescribing for new therapy by 6%, independent prescribing for dosage adjustment by 15% (mainly for aminoglycosides and anticoagulants) and independent prescribing for lab tests by 20%.The situation varies across the country with the most similarities in practice reported among the teaching hospitals.

A short-term plan, to address pharmacists' prescribing rights, might be accomplished through the establishment of a process to recognise specialization in pharmacy practice. The National Association of Pharmacy Regulatory Authorities' (NAPRA) 2002 spring newsletter reported that the Council supports the concept of establishing a process for pharmacists to become a "Registered Pharmacist Specialist".[7] The National Advisory Committee on Pharmacy Practice

(NACPP) continues to develop the framework for recognition and certification of pharmacist specialists in Canada.

Other readings

A recent position paper of the American College of Physicians-American Society of Internal Medicine (ACP-SIM), on pharmacist scope of practice has been at the heart of a recent debate. [8] Zed PJ, Loewen PS and Jewesson P have provided a positive and well balanced response to the argument evoked in that position paper, from the Canadian perspective. [9] The "Suggested readings" provided below provide further comparisons of clinical pharmacy services in Canada with the United States and other countries.

Conclusion

Even though the 2001/2002 survey results indicate that the majority of the pharmacists' time is not spent on clinical activities, it is important to remember that a pharmacist uses his/her knowledge and clinical expertise when carrying out all professional duties.

The 2001/2002 data illustrates that clinical pharmacy services have continued to grow based on the absolute paid hours dedicated to clinical services and the variety and complexity of clinical services provided. Changes to health care professionals' regulations, the emergence of drugs prescribing rights for pharmacists and the trend towards specialization will be key challenges in the years ahead.

Suggested Readings

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.

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[4] Murdaugh LB. American Society of Health-System Pharmacists. Competence assessment tools for health-system pharmacies. Bethesda, MD. 1998. ISBN 1-879907852

[5] Canadian Society of Hospital Pharmacists, Statement on Pharmacy Prescribing, August 2001 (www.cshp.ca)

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[7] Anonymous. Certification. Outlook – News about pharmacy regulatory activities. National Association of Pharmacy Regulatory Authorities. Spring 2002: 2.

[8] ACP-ASIM. Pharmacist scope of practice. Ann Intern Med 2002; 136: 79-85.

[9] Zed PJ, Loewen PS, Jewesson PJ. A response to the ACP-ASIM position paper on pharmacist scope of practice. Am J Health Syst Pharm 2002; 59: 1453-7.

Table B-1. Number of Outpatient Clinical Pharmacy Services and Resources Allocated (FTE) 2001/02

Hospitals (n=)	All (123)	Bed Size			Teaching Status		Pharmaceutical Care	
		100-200 (29)	201-500 (66)	>500 (28)	Yes (52)	No (71)	Yes (92)	No (16)
Respondents reporting FTE for Outpatient Clinical Services	94 76%	15 52%	54 82%	25 89%	46 88%	48 68%	77 84%	8 50%
Mean no. Different Services	4.0	2.7	3.9	4.8	4.4	3.6	4.2	3.1
Min	1	1	1	1	1	1	1	1
Max	10	6	9	10	10	9	10	9
Total FTE	2.32	0.84	2.09	3.68	3.15	1.51	2.54	1.28
Emergency room	0.64 (42)	0.38 (7)	0.60 (26)	0.94 (9)	0.80 (16)	0.54 (26)	0.70 (36)	0.23 (2)
Clinics (by frequency):								
- Haematology - oncology	1.10 (56)	0.57 (7)	1.00 (32)	1.52 (17)	1.43 (31)	0.69 (25)	1.14 (49)	0.45 (4)
- DVT / anticoagulant	0.50 (39)	0.21 (4)	0.60 (22)	0.41 (13)	0.62 (17)	0.40 (22)	0.51 (34)	0.63 (3)
- Diabetes	0.29 (37)	0.14 (4)	0.22 (22)	0.47 (11)	0.39 (19)	0.17 (18)	0.30 (32)	0.30 (2)
- Renal / dialysis	0.99 (36)	0.30 (1)	0.96 (18)	1.05 (17)	0.97 (23)	1.02 (13)	1.00 (29)	1.30 (2)
- Infectious Disease/AIDS	0.58 (29)	0.37 (3)	0.30 (14)	0.96 (12)	0.68 (22)	0.27 (7)	0.61 (27)	0.19 (2)
- Pain / palliative care	0.27 (24)	0.17 (3)	0.22 (18)	0.62 (3)	0.31 (10)	0.24 (14)	0.25 (20)	0.40 (3)
- Mental Health	0.24 (24)	0.11 (2)	0.27 (17)	0.19 (5)	0.22 (8)	0.25 (16)	0.26 (18)	0.09 (3)
- Cardiovascular / lipid	0.32 (23)	0.28 (4)	0.32 (13)	0.34 (6)	0.45 (10)	0.21 (13)	0.33 (21)	0.18 (2)
- Transplantation	0.39 (13)	0.25 (2)	0.30 (6)	0.56 (5)	0.42 (12)	0.10 (1)	0.42 (12)	0.10 (1)
- Asthma / allergy	0.26 (12)	-	0.30 (7)	0.20 (5)	0.29 (7)	0.22 (5)	0.24 (11)	0.50 (1)
- Geriatric Day Care	0.39 (11)	-	0.28 (7)	0.59 (4)	0.46 (8)	0.22 (3)	0.39 (11)	-
- Neurology	0.25 (5)	-	0.50 (1)	0.19 (4)	0.25 (5)	-	0.25 (5)	-
- Other	0.54 (25)	0.22 (4)	0.60 (11)	0.61 (10)	0.78 (14)	0.23 (11)	0.54 (23)	-

0.00 = average number of full-time equivalents dedicated to clinical services in that sector
() = Number of respondents reporting FTE for clinical services in that sector

Table B-2. Number of Inpatient Clinical Pharmacy Services and Resources Allocated (FTE) 2001/02

Hospitals (n=)	All (123)	Bed Size 100-200 (29)	Bed Size 201-500 (66)	Bed Size >500 (28)	Teaching Status Yes (52)	Teaching Status No (71)	Pharmaceutical Care Yes (92)	Pharmaceutical Care No (16)
Respondents reporting FTE for Inpatient Clinical Services	90 73%	18 62%	50 76%	22 79%	43 83%	47 66%	77 84%	5 31%
Mean no. Different Services	5.7	4.3	5.8	6.7	5.7	5.7	5.7	5.2
Min	1	1	1	1	2	1	1	4
Max	13	7	11	13	13	11	11	7
Total FTE	6.6	2.4	5.1	13.6	9.8	3.7	6.5	3.0
Adult Acute Care								
- Adult General Medical units	2.5 (74)	1.1 (15)	1.7 (42)	5.7 (17)	3.9 (31)	1.5 (43)	2.5 (62)	0.9 (5)
- Adult Surgical units	1.4 (65)	0.5 (12)	0.9 (37)	3.2 (16)	2.3 (28)	0.8 (37)	1.4 (53)	0.8 (5)
- Adult Intensive Care units	1.2 (62)	0.4 (10)	0.8 (33)	2.2 (19)	1.8 (29)	0.6 (33)	1.2 (53)	0.6 (4)
- Adult Haem-Oncology units	0.8 (26)	-	0.5 (12)	1.0 (14)	1.0 (19)	0.3 (7)	0.8 (23)	-
- Adult Mental Health units	0.7 (48)	0.2 (6)	0.6 (27)	0.9 (15)	1.0 (22)	0.4 (26)	0.6 (41)	0.3 (2)
- Obstetrics/ Gynaecology	0.3 (32)	0.2 (5)	0.3 (20)	0.5 (7)	0.6 (8)	0.2 (24)	0.3 (28)	0.3 (2)
- Other Acute Care	1.9 (38)	0.5 (6)	1.4 (22)	3.7 (10)	2.5 (26)	0.6 (12)	1.7 (34)	-
Pediatrics								
- Paediatric General Medical	0.8 (37)	0.6 (6)	0.7 (22)	0.9 (9)	1.6 (13)	0.3 (24)	0.8 (33)	0.2 (2)
- Paediatric Surgical units	0.4 (10)	0.5 (2)	0.3 (4)	0.6 (4)	0.6 (7)	0.1 (3)	0.4 (8)	-
- Paediatric Intensive Care	0.9 (19)	0.8 (3)	0.9 (9)	1.0 (7)	1.0 (15)	0.5 (4)	0.9 (16)	-
- Paediatric Haem-Oncology	1.1 (12)	0.6 (3)	1.7 (5)	0.8 (4)	1.2 (11)	0.7 (1)	1.2 (9)	-
- Paediatric Mental Health	0.2 (9)	0.2 (1)	0.3 (4)	0.2 (4)	0.3 (7)	0.1 (2)	0.2 (7)	-
Non-Acute Care								
- Adult Rehabilitation units	0.5 (25)	0.4 (4)	0.5 (16)	0.5 (5)	0.5 (8)	0.5 (17)	0.5 (23)	-
- Geriatrics / LTC units	0.7 (52)	0.2 (4)	0.6 (34)	1.0 (14)	0.8 (20)	0.6 (32)	0.7 (44)	0.5 (5)
- Paediatric Rehabilitation	0.3 (2)	-	0.2 (1)	0.3 (1)	0.3 (2)	-	0.3 (2)	-
- Other Non Acute Care	0.4 (4)	-	0.3 (3)	0.6 (1)	0.3 (1)	0.4 (3)	0.5 (3)	0.2 (1)

0.00 = average number of full-time equivalents dedicated to clinical services in that sector

() = Number of respondents reporting FTE for clinical services in that sector

Table B-3. Clinical Pharmacy Activities and Documentation 2001/02

		Bed Size			Teaching Status		Pharmaceutical Care	
Hospitals (n=)	All (123)	100-200 (29)	201-500 (66)	>500 (28)	Yes (52)	No (71)	Yes (92)	No (16)
Clinical Pharmacy Activities								
• Admission Histories	79	12	43	24	41	38	66	6
	64%	41%	65%	86%	79%	54%	72%	38%
• Discharge Interviews	94	19	51	24	48	46	75	12
	76%	66%	77%	86%	92%	65%	82%	75%
• Individual Patient Counselling	116	26	62	28	49	67	90	15
	94%	90%	94%	100%	94%	94%	98%	94%
• Patient Group Teaching	91	17	47	27	44	47	72	9
	74%	59%	71%	96%	85%	66%	78%	56%
• Regular Rounds with Physicians	75	9	39	27	48	27	63	4
	61%	31%	59%	96%	92%	38%	68%	25%
• Regular Rounds with Nurses	76	16	38	22	34	42	61	6
	62%	55%	58%	79%	65%	59%	66%	38%
• Routine Consultations with Physicians	97	18	53	26	48	49	79	9
	79%	62%	80%	93%	92%	69%	86%	56%
• Adverse Drug Reaction Reporting	103	21	56	26	45	58	82	12
	84%	72%	85%	93%	87%	82%	89%	75%
• Pharmacokinetic Dosing Services	108	24	57	27	48	60	85	14
	88%	83%	86%	96%	92%	85%	92%	88%
Interventions								
• Documented Interventions	99	23	51	25	41	58	78	12
	80%	79%	77%	89%	79%	82%	85%	75%
By % of those who document interventions								
• In Manual Pharmacy records	55	11	29	15	25	30	40	9
	56%	48%	57%	60%	61%	52%	51%	75%
• In Computerized Pharmacy records	52	11	28	13	21	31	45	4
	53%	48%	55%	52%	51%	53%	58%	33%
• Document in Medical Record	80	19	39	22	33	47	65	9
	81%	83%	76%	88%	80%	81%	83%	75%
Total Interventions								
# Therapeutic and Pharmacokinetic Interventions Made/ Year (n=61)	8,973	2,728	8,114	16,857	12,164	6,265	8,606	1,804
Ratios								
# Interventions per Admission (n=57)	0.60	0.61	0.62	0.55	0.60	0.60	0.60	0.32
# Interventions per Pharmacist FTE (n=58)	571	834	576	332	421	701	558	433

Table B-4. Clinical Practice Models and Seamless Care 2001/02

Hospitals (n=)	All (123)	Bed Size			Teaching Status		Pharmaceutical Care	
		100-200 (29)	201-500 (66)	>500 (28)	Yes (52)	No (71)	Yes (92)	No (16)
Clinical Practice Model								
• Pharmaceutical care	92	22	46	24	40	52	92	-
	75%	76%	70%	86%	77%	73%	100%	
- % of beds serviced (n=87)	33%	28%	35%	32%	41%	26%	33%	-
• Traditional clinical services	109	26	60	23	42	67	83	15
	89%	90%	91%	82%	81%	94%	90%	94%
- % of beds serviced (n=102)	57%	63%	55%	57%	53%	61%	51%	74%
• Some patients do not receive any clinical services	84	20	43	21	37	47	67	11
	68%	69%	65%	75%	71%	66%	73%	69%
- % of beds not serviced (n=80)	31%	36%	30%	27%	30%	31%	29%	46%
Seamless Care								
Established Policy for Seamless Care	38	7	22	9	23	15	35	1
	31%	24%	33%	32%	44%	21%	38%	6%
- % of patients with information transferred to community (n=33)	15%	17%	16%	12%	12%	19%	15%	20%
Information provision (n=38):								
• on request	25	4	14	7	15	10	22	1
	66%	57%	64%	78%	65%	67%	63%	100%
• on a prospective basis	31	6	16	9	19	12	29	-
	82%	86%	73%	100%	83%	80%	83%	
Information is provided to: (n=38)								
• community pharmacists	92%	86%	91%	100%	96%	87%	94%	-
• family physicians	68%	71%	59%	89%	70%	67%	71%	100%
• care centres	50%	43%	50%	56%	65%	27%	54%	-
• home care providers	58%	71%	50%	67%	70%	40%	60%	100%
• others	8%	0%	5%	22%	9%	7%	9%	0%
Information includes: (n=38)								
• medications at discharge	97%	100%	95%	100%	96%	100%	97%	100%
• medications discontinued during stay	71%	71%	68%	78%	83%	53%	71%	0%
• care plan information	58%	71%	50%	67%	57%	60%	63%	0%
• relevant drug / monitoring parameter and lab values	79%	86%	73%	89%	91%	60%	77%	100%
• diagnosis	58%	71%	45%	78%	61%	53%	57%	0%
• other	13%	14%	18%	0%	13%	13%	11%	0%
Seamless care documentation form also serves as prescription (n=38)	34%	43%	36%	22%	26%	47%	31%	0%

Table B-5. Use of Hand-held Devices 2001/02

Hospitals (n=)	All (123)	Bed Size			Teaching Status		Pharmaceutical Care	
		100-200 (29)	201-500 (66)	>500 (28)	Yes (52)	No (71)	Yes (92)	No (16)
Some pharmacists use hand-held devices for clinical activities	64	10	35	19	32	32	50	9
	52%	34%	53%	68%	62%	45%	54%	56%
Hand-held devices are used for (n=64)								
• Mail, agenda and task management	44	7	25	12	23	21	36	7
	69%	70%	71%	63%	72%	66%	72%	78%
• Clinical database consultation	61	10	33	18	30	31	48	9
	95%	100%	94%	95%	94%	97%	96%	100%
• Clinical data download from main pharmacy software	6	0	5	1	2	4	5	1
	9%	0%	14%	5%	6%	13%	10%	11%
• Clinical data entry and upload to main pharmacy software	4	0	4	0	1	3	3	1
	6%	0%	11%	0%	3%	9%	6%	11%
• Workload Data Collection	4	1	2	1	3	1	3	0
	6%	10%	6%	5%	9%	3%	6%	0%
• Other	13	1	8	4	7	6	9	1
	20%	10%	23%	21%	22%	19%	18%	11%
Hospital funding of hand-held devices (n=64)								
• full funding	24	5	14	5	9	15	18	3
	38%	50%	40%	26%	28%	47%	36%	33%
• partial funding	12	3	4	5	6	6	9	3
	19%	30%	11%	26%	19%	19%	18%	33%

Table B-6. Evaluation of Clinical Pharmacy Services 2001/02

Hospitals (n=)	All (123)	Bed Size			Teaching Status		Pharmaceutical Care	
		100-200 (29)	201-500 (66)	>500 (28)	Yes (52)	No (71)	Yes (92)	No (16)
Evaluation of direct care services by auditing sample of clinical activities	24 20%	2 7%	16 24%	6 21%	15 29%	9 13%	22 24%	-
Evaluation is done by (n= 24)								
• peers, e.g., other pharmacists	18 75%	2 100%	12 75%	4 67%	12 80%	6 67%	16 73%	-
• physicians	5 21%	-	3 19%	2 33%	4 27%	1 11%	5 23%	-
• others	12 50%	1 50%	8 50%	3 50%	8 53%	4 44%	12 55%	-
Method for evaluation (n=24)								
• chart review - retrospective	16 67%	2 100%	11 69%	3 50%	8 53%	8 89%	14 64%	-
• direct observation	12 50%	1 50%	7 44%	4 67%	8 53%	4 44%	11 50%	-
• self-evaluation by pharmacists	10 42%	2 100%	6 38%	2 33%	6 40%	4 44%	8 36%	-
• other	4 17%	-	2 13%	2 33%	3 20%	1 11%	4 18%	-
Evaluated aspects of clinical practice (n=24)								
• competency assessment	14 58%	1 50%	8 50%	5 83%	9 60%	5 56%	14 64%	-
• patient assessment	11 46%	2 100%	5 31%	4 67%	6 40%	5 56%	11 50%	-
• implementation of objectives and monitoring plan	13 54%	-	8 50%	5 83%	10 67%	3 33%	12 55%	-
• patient counselling and understanding	11 46%	2 100%	5 31%	4 67%	6 40%	5 56%	10 45%	-
• documentation	19 79%	2 100%	12 75%	5 83%	11 73%	8 89%	17 77%	-
• other	4 17%	-	4 25%	-	3 20%	1 11%	4 18%	-
Evaluation results are shared with (n=24)								
• pharmacists	19 79%	1 50%	12 75%	6 100%	13 87%	6 67%	17 77%	-
• professional practice/ quality of care committee	5 21%	1 50%	3 19%	1 17%	3 20%	2 22%	4 18%	-
• multidisciplinary care team	1 4%	-	1 6%	-	-	1 11%	-	-
• other	8 33%	-	5 31%	3 50%	6 40%	2 22%	8 36%	-
Proportion of pharmacists evaluated (n=24)	41%	50%	43%	32%	34%	53%	40%	

Table B-7. Prescribing Privileges 2001/02

Hospitals (n=)	All (123)	Bed Size 100-200 (29)	Bed Size 201-500 (66)	Bed Size >500 (28)	Teaching Status Yes (52)	Teaching Status No (71)	Pharmaceutical Care Yes (92)	Pharmaceutical Care No (16)
Other professionals prescribe drugs (besides physicians and dentists)	66	9	36	21	36	30	52	6
	54%	31%	55%	75%	69%	42%	57%	38%
Prescribing rights of other professionals								
• Nurse practitioners	30	7	10	13	20	10	23	2
	24%	24%	15%	46%	39%	14%	25%	13%
• Midwives	28	2	16	10	11	17	20	5
	23%	7%	24%	36%	21%	24%	22%	31%
• Pharmacists	42	2	28	12	23	19	34	1
	34%	7%	42%	43%	44%	27%	37%	6%
• Other	11	1	4	6	6	5	8	1
	9%	3%	6%	21%	12%	7%	9%	6%
Involved in the approval process (n=66)								
• Hospital Board of Directors	18	1	12	5	11	7	12	3
	27%	11%	33%	24%	31%	23%	23%	50%
• University	3	-	2	1	2	1	2	-
	5%		6%	5%	6%	3%	4%	
• Medical Advisory Board	58	8	33	17	31	27	45	5
	88%	89%	92%	81%	86%	90%	87%	83%
• P & T Committee	45	7	22	16	25	20	34	4
	68%	78%	61%	76%	69%	67%	65%	67%
• Other	11	3	4	4	6	5	10	1
	17%	33%	11%	19%	17%	17%	19%	17%
Prescribing rights approved for pharmacists (n=66)								
• Independent, for lab tests	13	1	10	2	7	6	8	-
	20%	11%	28%	10%	19%	20%	15%	
• Independent, for dosage adjustments	10	1	7	2	5	5	8	-
	15%	11%	19%	10%	14%	17%	15%	
• Independent, for new therapy	4	-	3	1	2	2	4	-
	6%		8%	5%	6%	7%	8%	
• Dependent, for dosage adjustments	37	2	24	11	19	18	29	1
	56%	22%	67%	52%	53%	60%	56%	17%
• Dependent, for new therapy	13	-	6	7	10	3	10	1
	20%		17%	33%	28%	10%	19%	17%

Drug Information and Drug Use Evaluation Services

Nancy Roberts

It has been four years since the drug information section has been included in the Canadian hospital pharmacy survey. As part of the 2001/2002 survey, new questions were included to evaluate resources dedicated to drug use evaluation services, as well as non-pharmacist support for both drug information and drug use evaluation services.

Thirty one percent of the 2001/2002 survey respondents reported that their hospitals had dedicated staff for the provision of drug information and drug use evaluation services, (Table C-1) compared to 24% reporting dedicated staff for drug information in 1997/98 and 25% in 1996/97. This represents a potential 25% increase since the 1997/98 survey. However, the addition of drug use evaluation services to this question limits the comparability of this year's data with data from previous years. The fact that the number of sites reporting FTEs dedicated to drug information services remained at 29, the same figure as the 1997/98-survey response, would suggest that the responses to this question do not reflect a true change.

Overall, in hospitals with dedicated staffing, the average of number of pharmacist full time equivalents (FTEs) assigned to drug information services decreased from 1.25 in 1997/98 to 1.1 in 2001/2002. It had been suggested in the past that the number of pharmacist FTEs dedicated to drug information services might decrease as the pharmaceutical care model of practice continued to expand across the country. In reviewing the response for practice models used (refer to the clinical pharmacy services section), there was an increase in respondents practicing pharmaceutical care from 66% in the 1997/98 survey to 75% in the 2001/2002 survey. It could therefore be debated that the combined time of the pharmacist dedicated to drug information and the pharmaceutical care pharmacist's time spent on drug information may actually surpass the FTE results listed above.

In spite of the overall reduction of the average of number of pharmacist full time equivalents assigned to drug information, increases were seen in the 100-200 bed and non-teaching hospital categories. In both categories of hospitals, the average of number of pharmacist FTEs assigned increased from 0.1 in 1997/98 to 0.5 in 2001/2002. The proliferation of new drugs that entered the market over the period between the surveys, along with the increased complexity for monitoring and administration, may be providing motivation for the small and non-teaching hospitals to support members of the patient care team in medication therapy management.

Fifty-six percent (18/32) of hospitals with dedicated staff to provide drug information and drug use evaluation services also had dedicated clerical, technical and support staff FTEs assigned to drug information services. The average number of clerical, technical and support staff FTEs assigned was 0.3. This assignment was predominately seen in hospitals with >500 beds and in teaching hospitals.

Dedicated pharmacist FTEs assigned to drug use evaluation services was reported by 24% (29/123) of the 2001/2002 survey respondents. The average number of pharmacist FTEs assigned was 0.8 and the majority of sites reporting dedicated staff for drug use evaluation services were located in hospitals with >200 beds.

The average reported annual budget for books, journals and other reference materials (i.e. electronic sources) was $17,081, which was 122% higher that the amount of $7,698 reported in the 1997/98 survey. The amounts ranged from a low of $400 to a high of $ 135,000. This significant increase, since 1997/98, appears to be due to the inclusion of costs for electronic reference materials used on a multi-site and/or regional basis. In many cases the budget for books, journals and electronic references is shared with other departments (i.e. Information Systems, Health Science Library, etc), as communicated in the comments section of the survey by a number of respondents. As in past surveys, the average was significantly higher in organizations with > 500 beds and in teaching institutions.

Table C-1. Drug Information and Drug Use Evaluation Services 2001/02

Hospitals (n=)	All (123)	Bed Size			Teaching Status	
		100-200 (29)	201-500 (66)	>500 (28)	Yes (52)	No (71)
Drug information / drug use evaluation services have dedicated staff	38 31%	2 7%	18 27%	18 64%	27 52%	11 15%
Drug information services						
• FTE pharmacists (n=29)	1.1	0.5	0.7	1.4	1.2	0.5
• FTE support staff (n=32)	0.3	-	0.2	0.4	0.3	0.04
Drug use evaluation services						
• FTE pharmacists (n=29)	0.8	0.6	0.6	1.1	0.8	0.7
• FTE support staff (n=29)	0.05	-	0.06	0.05	0.06	0.04
Annual budget for reference materials (n=104)	$17,081	$7,994	$14,860	$33,165	$25,498	$11,604

Drug Distribution - Inpatients

Steve Long

Oral medication systems

There has been little change in the approaches taken to distribute drugs within Canadian hospitals since the last Annual Report. As outlined in Table D-1, 54% of respondents indicated a single drug distribution system was supported in their facilities for ≥90% of beds. A unit dose system was in place to support some beds in 54% of respondents' hospitals and ≥90% of beds in 24%. A traditional system supported some beds in 68% of respondents' hospitals and ≥90% of beds in 27%. Twenty-three respondents indicated that some beds were supported by a total wardstock system. No respondents indicated that total wardstock systems supported ≥ 90% of beds. Controlled or carded dose systems were reported to support some beds in 36 hospitals (29%) and ≥90% of beds in one facility. Figure D-1 provides information on the overall reported proportion of beds serviced by each type of drug distribution system.

The use of unit based automated dispensing has almost doubled since the last report. Twenty-two respondents (18%) indicated it was in place in their facilities, compared to 12 hospitals (10%) in 1999/2000. These systems were reported to support some beds in 18 facilities and ≥90% in four. Five respondents did not indicate the percentage of beds supported by this technology. Unit based automated dispensing was utilized in the operating room in seven facilities and in other areas in 17 facilities.

In "Building a Safer System - A National Integrated Strategy for Improving Patient Safety in Canadian Health Care", the final report of the National Steering Committee on Patient Safety, a key recommendation is to implement system changes that have a demonstrated ability to improve patient safety[1]. An example cited is conversion to a unit-dose medication system. The doubling of unit based automation is a step in this direction. The response to this survey, however, outlines that traditional medication systems continue to be the most common medication delivery systems in use in Canadian hospitals. With the increased focus on patient safety, the potential for coordination of services across multiple, regional facilities, and advances in technology, it is hoped that pharmacists will assume a leadership role in ensuring safer medication systems are implemented in Canadian hospitals.

Medication Order Entry

It appears strategies are being implemented to move pharmacy staff closer to patients and other members of the health team. Medication order entry was reported to be performed in satellites in 38% of facilities, (Table D-2) compared to 30% in the 1999/2000 Annual Report, and on nursing units or patient care areas in 43% of facilities, compared with 35% reported in the 1999/2000 Annual Report. The shift to satellites was more pronounced in teaching facilities, while the shift to patient care areas was more pronounced in non-teaching hospitals. The central pharmacy remained the most common site for medication order entry; medication order entry was reported to occur in the central pharmacy in 95% of respondents' hospitals.

Pharmacy staff performed the majority of order entry. Only three respondents indicated that nurses had entered orders, four that physicians had entered orders and three that others entered orders. Pharmacists did not verify physician order entry, while two of three respondents indicated that order entry completed by nurses and others was subject to verification by a pharmacist.

Pharmacy technician order entry was reported to occur in 73% of respondents' hospitals. This was a slightly lower percentage than the 77% reported in the 1999/2000 Report. A slight increase in technician order entry was reported in non-teaching hospitals (from 69% to 75%), and a shift away in teaching hospitals from 85% to 73%. These shifts may be related to the increase in use of satellites and unit based medication order entry noted above.

Technician order entry was verified by pharmacists in 77% of facilities where technician order entry occurred. Verification of technician order entry by pharmacists was reported to occur in 85% of facilities in the 1999/2000 Annual Report. The percentage of facilities where technician order entry was verified by

pharmacists has decreased in both teaching and non-teaching hospital categories. A possible explanation for the decline in verification of technician order entry is a shift in process to separate the pharmacist review of medication orders for clinical appropriateness from the clerical and technical functions of entering the order and preparing and packaging medications for delivery to the unit. This separation is emphasized as pharmacists become more active on units and in satellites and are supported by information systems that support ongoing review of medication orders. The types of medication orders that were entered by technicians and the percentage of respondents indicating that the orders were verified by pharmacists are provided in Table D-3. Wardstock orders (51%) and traditional prescription refills (61%) were least often reported as verified by a pharmacist. Greater than 85% of respondents indicated that technician order entry of new outpatient prescriptions, chemotherapy orders, TPN orders, and IV admixture orders were verified by a pharmacist in their facilities.

Intravenous admixture services

Though limited changes have occurred in oral medication distribution, provision of pharmacy based intravenous (IV) admixture services is increasing (Table D-4). This service was reported to be available in 81% of respondents hospitals compared to 75% in the 1999/2000 Annual Report (Figure D-3). It was provided to $\geq$90% of patient care areas in 50% of respondents' hospitals, including 69% of teaching hospitals. The proportion of patients or patient care areas to which IV admixture services were provided, in facilities that stated partial implementation, increased from 28% to 38% since the last Report and approached 50% in teaching hospitals.

Total IV admixture production increased to 103,182 doses. The average of reported doses prepared for inpatients was 83,599 doses. The average for outpatients was 6,396 doses, based on 13 respondents who provided a specific response for outpatient production. The average of reported doses prepared for home patients was 6,345 doses (15 respondents). IV admixture production per acute patient day also increased. This calculation is based on responses for hospitals in which service was provided to $\geq$90% of patient care areas. On average, 1.19 IV admixtures were prepared per patient day, up from 1.09 in the previous report. In non-teaching hospitals, the average increased from 0.81 to 1 admixture per patient day.

A minibag system was stated to be the primary system for the administration of intravenous drugs by 54% of respondents (66/123), syringe infusors by 33% (40/123), buretrols or burettes by 9% (11/123), and other forms of delivery by 2% (2/123). The proportion of the types of systems utilized to deliver intravenous medications to patients is similar to that of previous reports.

Chemotherapy

Production of chemotherapy was not reported in the 1999/2000 Annual Report. The production of oncolytic agents continues to occur within pharmacy. Chemotherapy services were provided in 108 hospitals (88% of respondents) and pharmacy staff prepared the doses in 97% (105/108) of these facilities. The average of reported number of chemotherapy admixtures prepared was 8,872 (Table D-5). The average of reported number of chemotherapy doses prepared for inpatients was 2,929, for outpatients was 8,231, and for home patients 402 doses. Home services were offered by six facilities, five in Quebec, one in New Brunswick.

Total Parenteral Nutrition

Production of TPN was also not reported in the 1999/2000 Annual Report. Respondents to this year's survey indicate little has changed. TPN production was reported to occur in 92% (113/123) of respondents' hospitals. In 92% (104/113) of these facilities, TPN was produced in pharmacy. The average reported number of bags prepared annually was 4,788 (Table D-6). The average of reported number of bags produced for inpatients was 3,523 bags and the average of bags provided for outpatients was 3,447. Some facilities utilize a prepared volume of one litre, while others pump a single bag to meet the patient's daily nutritional requirements. The survey did not discern differences in practice in

respondents' facilities and therefore these values should be used with caution in making projections within your facility.

Technicians checking technicians

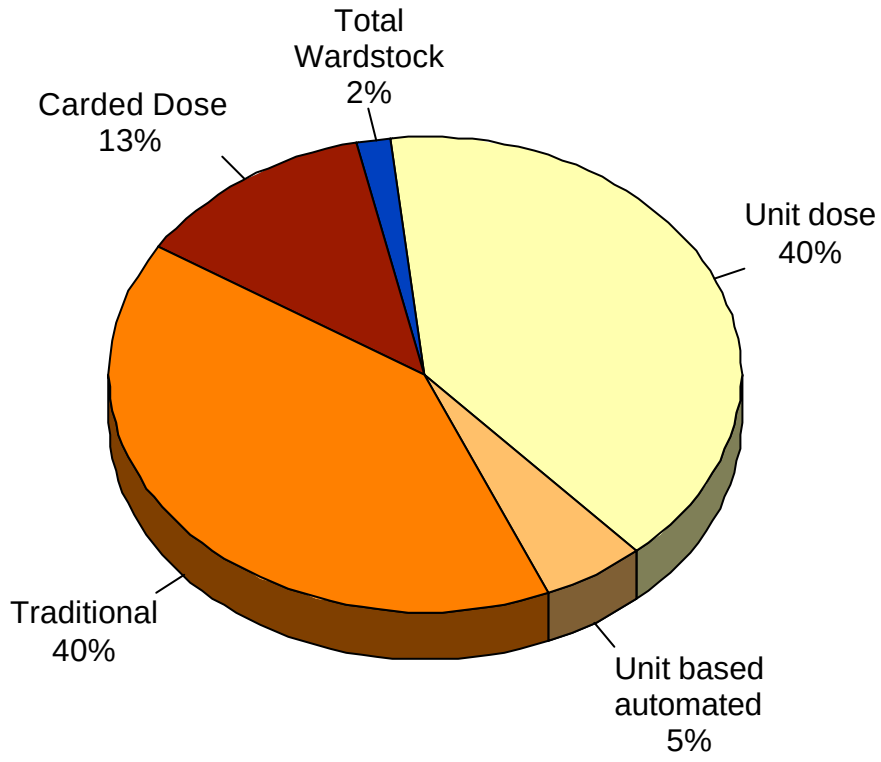
The use of technicians to check other technicians in the preparation of medications has become common practice and is increasing (Figure D2). Technicians have demonstrated they can ensure products are prepared and delivered accurately. This, coupled with ongoing difficulty in recruiting of pharmacists, supports the increased shift in activity to technicians. Greater than 40% of respondents indicated that unit dose packaging (46%), preparation of cardiac arrest trays (45%), and batch intravenous admixture production (41%) were checked by technicians in their facilities.

Respondents indicated that certification programs have been created to ensure the accuracy of technicians in the checking function and to support technicians in assuming this role. Table D-7 outlines services performed by technicians and the percentage of respondents that have tech check tech systems in place, as well as those that had established certification procedures for these checks. Certification for technician checking of IV admixture preparation (batching) and unit dose packaging were in place in 28% and 29% of respondents' facilities, respectively.

References

1. Wade, J, Chair, National Steering Committee on Patient Safety, Building a safer system: a national integrated strategy for improving patient safety in Canadian health care. September 2002. ISBN 0 9692155-3-3

Figure D-1. PROPORTION OF BEDS SERVICED BY DRUG DISTRIBUTION SYSTEM 2001/02



Base: All respondents (123)

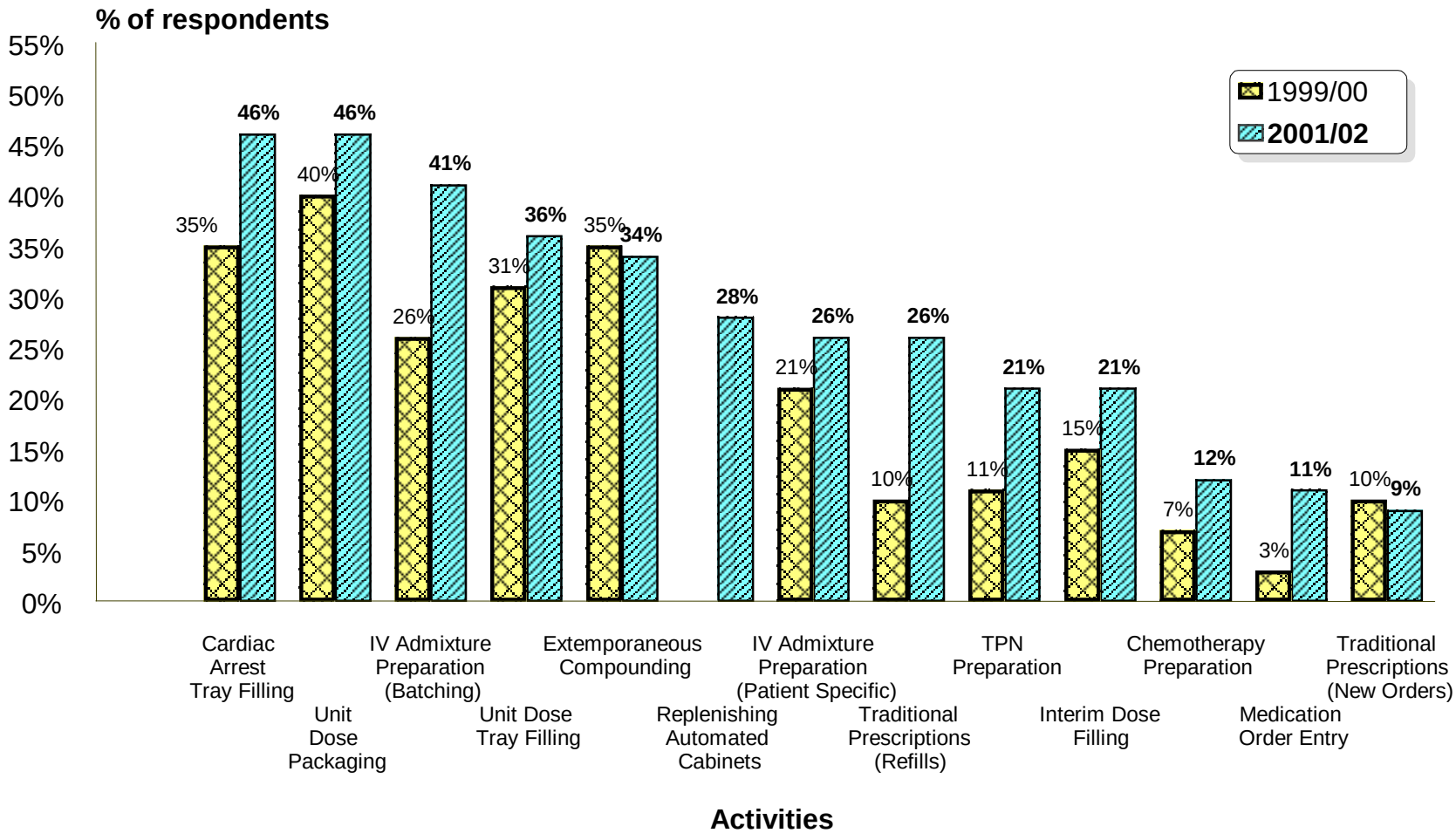
Table D-1. Drug Distribution Systems 2001/02

Hospitals (n=)	All (123)	Bed Size 100-200 (29)	Bed Size 201-500 (66)	Bed Size >500 (28)	Teaching Status Yes (52)	Teaching Status No (71)
Unit dose						
• some beds	66	8	39	19	32	34
	54%	28%	59%	68%	62%	48%
• >= 90% of beds	29	3	20	6	15	14
	24%	10%	30%	21%	29%	20%
Unit based automated dispensing system						
• some beds	22	2	11	9	14	8
	18%	7%	17%	32%	27%	11%
• >= 90% of beds	4	1	1	2	2	2
	3%	3%	2%	7%	4%	3%
Traditional						
• some beds	84	23	40	21	39	45
	68%	79%	61%	75%	75%	63%
• >= 90% of beds	33	14	16	3	13	20
	27%	48%	24%	11%	25%	28%
Total wardstock						
• some beds	23	4	13	6	9	14
	19%	14%	20%	21%	17%	20%
• >= 90% of beds	-	-	-	-	-	-
Controlled/ carded dose						
• some beds	36	5	22	9	11	25
	29%	17%	33%	32%	21%	35%
• >= 90% of beds	1	1	-	-	-	1
	1%	3%				1%
One system for oral medication for >=90% of beds	66	18	37	11	30	36
	54%	62%	56%	39%	58%	51%

Table D-2. Medication Order Entry 2001/02

Hospitals (n=)	All (123)	Bed Size			Teaching Status	
		100-200 (29)	201-500 (66)	>500 (28)	Yes (52)	No (71)
Locations where order entry is performed						
• Central Pharmacy	117	28	64	25	48	69
	95%	97%	97%	89%	92%	97%
• Satellites	47	5	22	20	34	13
	38%	17%	33%	71%	65%	18%
• Nursing units/ patient care areas	53	10	26	17	26	27
	43%	34%	39%	61%	50%	38%
Personnel who perform and check order entry						
• Pharmacists	105	21	59	25	46	59
	85%	72%	89%	89%	88%	83%
- Verified by pharmacist (n=105)	28	2	17	9	14	14
	27%	10%	29%	36%	30%	24%
• Technicians	90	22	47	21	37	53
	73%	76%	71%	75%	71%	75%
- Verified by pharmacist (n=90)	69	14	39	16	29	40
	77%	64%	83%	76%	78%	75%
• Nurses	3	-	1	2	3	-
	2%		2%	7%	6%	
- Verified by pharmacist (n=3)	2	-	-	2	2	-
	67%			100%	67%	
• Physicians	4	1	2	1	3	1
	3%	3%	3%	4%	6%	1%
- Verified by pharmacist (n=4)	-	-	-	-	-	-
• Others	3	1	1	1	2	1
	2%	3%	2%	4%	4%	1%
- Verified by pharmacist (n=3)	2	1	-	1	1	1
	67%	100%		100%	50%	100%

Figure D-2. TECHNICIAN ACTIVITIES CHECKED BY OTHER TECHNICIANS 1999/00 and 2001/02



Base: All respondents (1999/00: 115, 2001/02: 123)

Table D-3. Medication Order Entry By Technicians 2001/02

Hospitals (n=)	All (123)	Bed Size			Teaching Status	
		100-200 (29)	201-500 (66)	>500 (28)	Yes (52)	No (71)
No order entry by technicians	20	3	13	4	8	12
	16%	10%	20%	14%	15%	27%
Some Order Entry by technicians						
Wardstock orders	83	24	40	19	35	48
	67%	83%	61%	68%	67%	68%
- Verified by pharmacist (n=83)	42	9	21	12	23	19
	51%	38%	53%	63%	66%	40%
Traditional prescriptions, new orders	77	21	37	19	32	45
	63%	72%	56%	68%	62%	63%
- Verified by pharmacist (n=77)	65	16	32	17	28	37
	84%	76%	86%	89%	88%	82%
Traditional prescriptions, refills	80	21	41	18	32	48
	65%	72%	62%	64%	62%	68%
- Verified by pharmacist (n=80)	49	10	24	15	19	30
	61%	48%	59%	83%	59%	63%
Unit dose orders	43	8	25	10	19	24
	35%	28%	38%	36%	37%	34%
- Verified by pharmacist (n=43)	34	7	20	7	15	19
	79%	88%	80%	70%	79%	79%
IV admixture orders	67	17	35	15	29	38
	54%	59%	53%	54%	56%	54%
- Verified by pharmacist (n=67)	58	14	32	12	24	34
	87%	82%	91%	80%	83%	89%
TPN Orders	60	15	31	14	26	34
	49%	52%	47%	50%	50%	48%
- Verified by pharmacist (n=60)	53	11	29	13	24	29
	88%	73%	94%	93%	92%	85%
Chemotherapy orders	44	12	20	12	20	24
	36%	41%	30%	43%	38%	34%
- Verified by pharmacist (n=44)	38	9	18	11	19	19
	86%	75%	90%	92%	95%	79%
Outpatient prescriptions, new orders	61	13	34	14	29	32
	50%	45%	52%	50%	56%	45%
- Verified by pharmacist (n=61)	57	10	33	14	29	28
	93%	77%	97%	100%	100%	88%
Outpatient prescriptions, refills	63	12	36	15	30	33
	51%	41%	55%	54%	58%	46%
- Verified by pharmacist (n=63)	52	10	28	14	24	28
	83%	83%	78%	93%	80%	85%

Table D-4. IV Admixture Services and Averages of Reported Annual Productions 2001/02

Hospitals (n=)	All (123)	Bed Size			Teaching Status	
		100-200 (29)	201-500 (66)	>500 (28)	Yes (52)	No (71)
Provision of Some IV Admixture Services	100 81%	19 66%	55 83%	26 93%	47 90%	53 75%
Extent of areas covered by service						
>= 90% of patient care areas	62 50%	11 38%	34 52%	17 61%	36 69%	26 37%
If partial, % of patient care areas (n=37)	38%	36%	32%	55%	47%	34%
Annual production of IV Admixtures						
• Total	103,182 (88)	33,697 (17)	78,060 (48)	206,970 (23)	165,370 (42)	46,402 (46)
• Inpatients	83,599 (38)	25,989 (8)	59,220 (21)	191,692 (9)	127,215 (18)	44,345 (20)
• Outpatients	6,396 (13)	7,321 (2)	4,813 (9)	12,598 (2)	12,425 (5)	2,628 (8)
• Home patients	6,345 (15)	4,206 (1)	4,259 (7)	8,738 (7)	6,652 (8)	5,995 (7)
Ratio						
IV production per acute patient day >=90% of patient care areas	1.19 (55)	1.16 (10)	1.15 (31)	1.27 (14)	1.33 (31)	1.00 (24)

Base: Pharmacy departments providing complete data ( )

Table D-5. Averages of Reported Annual Productions of IV Chemotherapy 2001/02

Hospitals (n=)	All (123)	Bed Size			Teaching Status	
		100-200 (29)	201-500 (66)	>500 (28)	Yes (52)	No (71)
Annual production of IV Chemotherapy						
• Total	8,872	5,170	6,930	16,242	12,611	5,851
	(94)	(18)	(53)	(23)	(42)	(52)
• Inpatients	2,929	1,402	2,253	4,707	4,289	929
	(42)	(7)	(21)	(14)	(25)	(17)
• Outpatients	8,231	7,090	7,258	11,217	9,111	7,384
	(51)	(11)	(27)	(13)	(25)	(26)
• Home patients	402	-	227	750	480	8
	(6)		(4)	(2)	(5)	(1)

Base: Pharmacy departments provi ding complete data ( )

Table D-6. Averages of Reported Annual Productions of TPN 2001/02

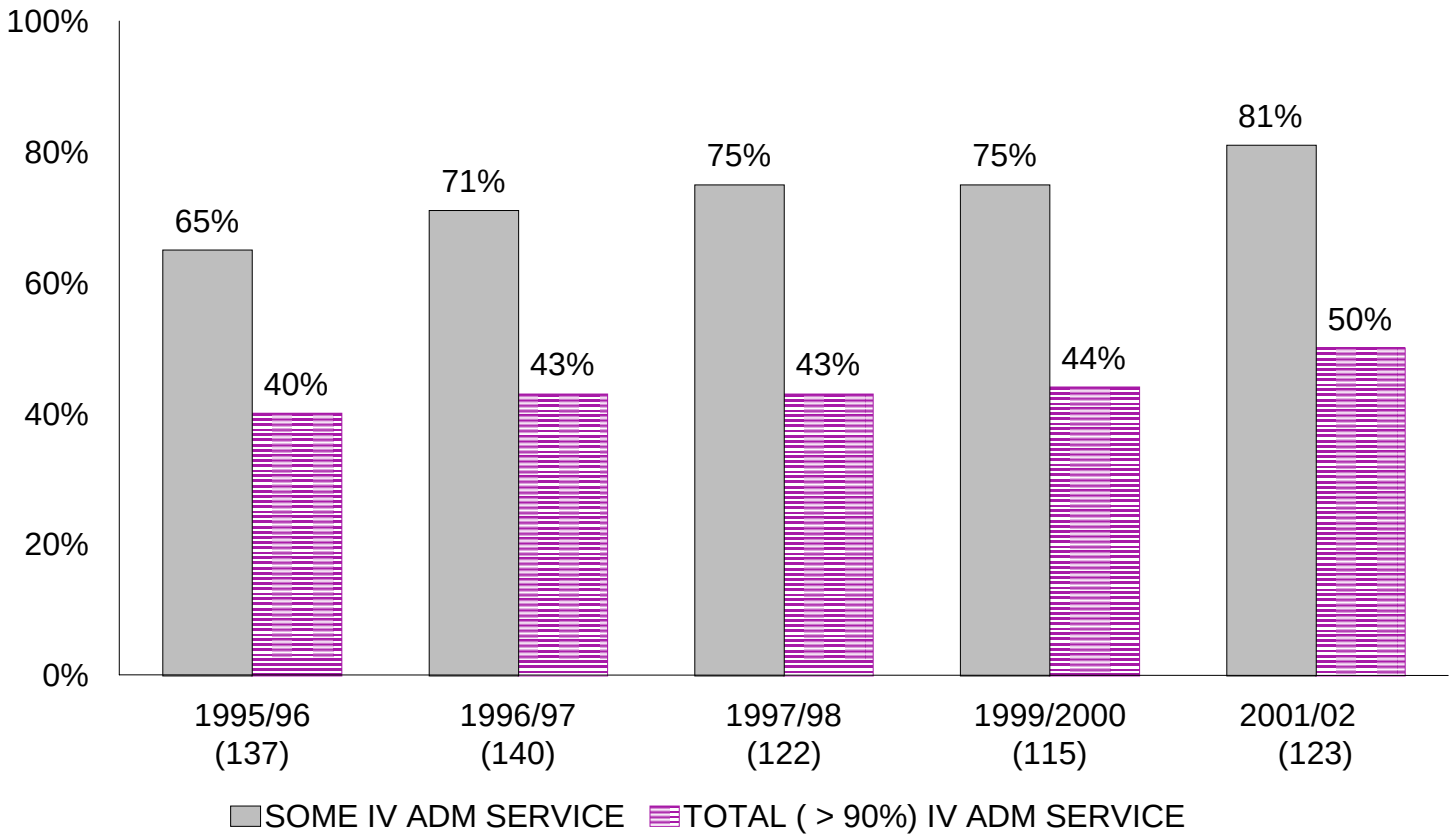
Hospitals (n=)	All (123)	Bed Size			Teaching Status	
		100-200 (29)	201-500 (66)	>500 (28)	Yes (52)	No (71)
Annual production of TPN						
• Total	4,788	1,886	4,881	7,037	7,893	2,101
	(97)	(21)	(51)	(25)	(45)	(52)
• Inpatients	3,523	1,999	2,765	6,520	5,054	2,227
	(72)	(17)	(37)	(18)	(33)	(39)
• Home patients	3,447	391	4,455	3,251	3,667	1,467
	(10)	(1)	(4)	(5)	(9)	(1)

Base: Pharmacy departments providing complete data ( )

Table D-7. Technician Activities Checked by Other Technicians and Certification Required 2001/02

Hospitals (n=123)	Tech Check Tech Total	Certification Required Yes	Certification Required No
IV Admixture Preparation (Batching)	49 40%	34 28%	15 12%
IV Admixture Preparation (Patient Specific)	29 24%	26 21%	3 2%
TPN Preparation	21 17%	14 11%	7 6%
Chemotherapy Preparation	6 5%	6 5%	0 0%
Unit Dose Packaging	56 46%	36 29%	20 16%
Unit Dose Tray Filling	44 36%	29 24%	15 12%
Interim Dose Filling	26 21%	16 13%	10 8%
Replenishing Automated Cabinets	33 27%	11 9%	22 18%
Traditional Prescriptions (Refills)	32 26%	21 17%	11 9%
Traditional Prescriptions (New Orders)	11 9%	10 8%	1 1%
Medication Order Entry	6 5%	3 2%	3 2%
Cardiac Arrest Tray Filling	55 45%	22 18%	33 27%
Extemporaneous Compounding	39 32%	19 15%	20 16%

Figure D-3. PERCENTAGE OF IV ADMIXTURE SERVICE PROVIDERS 1995/96 – 2001/02



Base: All respondents ( )

Drug Purchasing and Inventory Control

Steve Long

The Patented Medicine Prices Review Board (PMPRB), in their 2001 Annual Report, reported that total sales of all drugs for human use by manufacturers in Canada increased by 15% and that sales of patented drugs increased by 18.9% in 2001[1]. Pharmaceutical expenditure accounted for 15.2% of overall health care expenditure in Canada in 2000, up from 11.4% in 1990[2]. Drug costs continue as one of the fastest growing areas of health care expenditure. This rapid growth is bringing pharmacy services under increased scrutiny within organized health care settings.

The increase in drug costs reported by PMPRB is mirrored in Canadian hospitals. Reported annual drug costs for respondents' hospitals have increased by almost $1.5 million since the 1999/2000 Annual Report to an average of $ 6,686,781 (Table E-1). This has occurred with minimal change in hospital size, patient days, or clinic visits. The increases are noted for all hospital sizes and for teaching and non-teaching hospitals. Acute care inpatient drug costs per patient day have increased from $27.55 to $30.99 and cost per admission from $196.93 to $222 since 1999/2000. Similar increases are noted in non-acute care inpatient drug costs (from $5.47 to $6.61) clinic and and emergency room visit costs (from $4.22 to $6.48.) The drug cost per visit in medical day units was calculated as $9.92 (this calculation excludes emergency room visits from the denominator and therefore is not comparable to the value reported in previous Annual Reports).

As demonstrated in Table E-1 drug costs in all areas have increased. The greatest relative increases have occurred in outpatient areas (clinics/medical day units, emergency rooms, and ambulatory/take home). In the 1999/2000 Annual Report, these outpatient areas accounted for 27% of total expenditure. For 2001/2002 these same areas accounted for 36% of total expenditure (see Table E-2 and Figure E-1). Respondent comments associated the increases with new therapies (including infliximab and visudyne) and expansion of provincially sponsored programs or shifts in funding models for cancer care, HIV/AIDS treatment, multiple sclerosis therapies and anemia management. In small to medium hospitals (100-500 bed facilities), the growth has mainly occurred in clinics/medical day units and emergency rooms. Larger hospitals appear to have avoided such substantial growth in the emergency room, by channeling patients to ambulatory (take home) programs. These programs are probably supported by outpatient pharmacy services unavailable in smaller centres. They also may represent funding of provincial drug programs that are made available through larger, teaching centres. This shift in emphasis presents pharmacy managers with a considerable challenge. The shift is resulting in increased demands to provide clinical support for ambulatory programs, to extend formulary decisions into specialty ambulatory areas, and to support expanded provincial programs, while maintaining pharmaceutical care for inpatient areas. It is also creating requirements for a change in medication delivery to areas that have traditionally been serviced by wardstock systems.

Eleven respondents indicated that drug costs decreased this past year. The average magnitude of the decrease by bed size and teaching status is provided in Table E-3. Forty-one respondents were able to provide the magnitude of drug cost increases. These averages are also provided in the Table E-3. These averages are consistent, as noted above, with the PMPRB report.

The value of inventory carried by hospitals is reported to have increased to $631,105, from $469,810 in 1999/2000 while an average of 9.6 inventory turns per year was reported, up from 9.3.

References

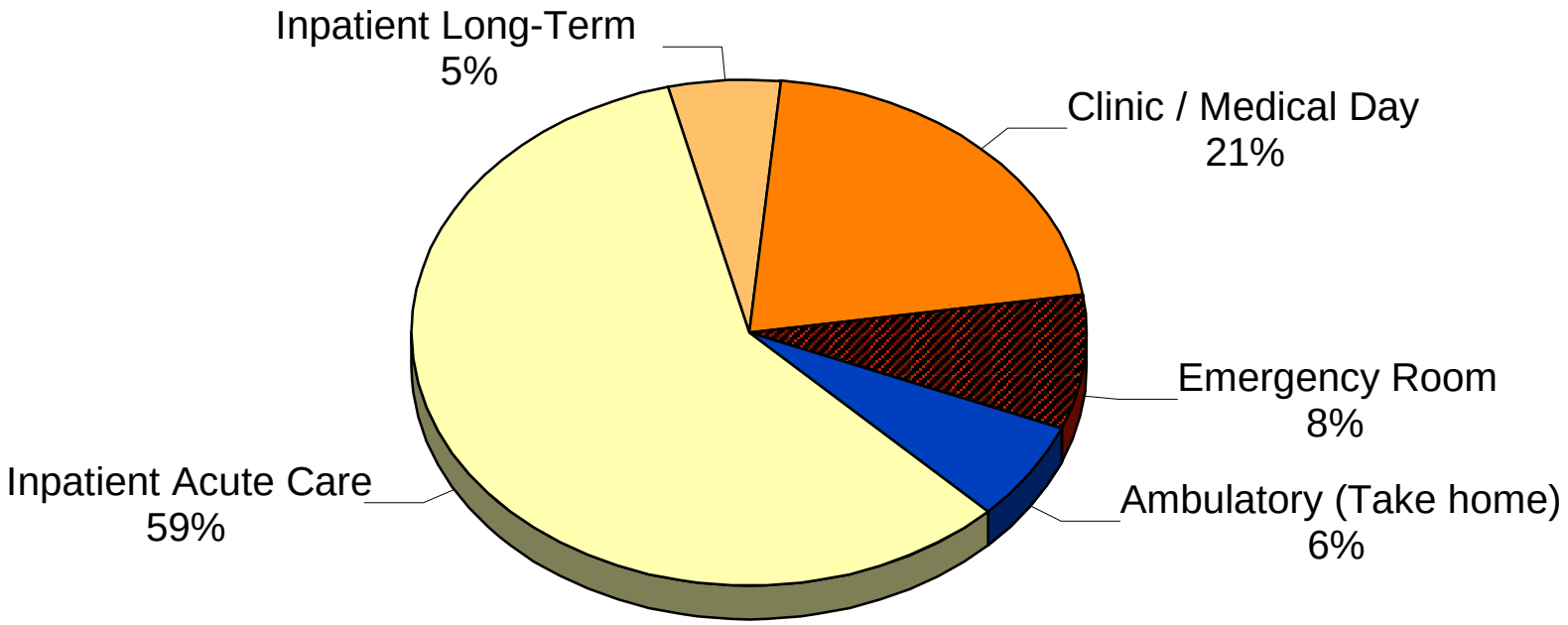
1. Patented Medicine Prices Review Board, Annual Report 2001 Page 8
2. Patented Medicine Prices Review Board, Newsletter July 29, 2002 Page 3-4

Table E-1. Inventory and Drug Costs 2001/02

Hospitals (n=)	All (123)	Bed Size			Teaching Status	
		100-200 (29)	201-500 (66)	>500 (28)	Yes (52)	No (71)
Inventory						
Total Value at Year End	$631,105	$210,907	$490,633	$1,373,823	$1,038,683	$345,192
Inventory Turns per Year	9.6	8.3	9.4	11.3	11.0	8.6
Drug Costs by Area						
• Total	$6,686,781 (107)	$1,657,834 (28)	$4,337,764 (53)	$16,890,951 (26)	$12,078,747 (47)	$2,463,074 (60)
• Acute Care Inpatient	$3,534,198 (72)	$1,060,240 (17)	$2,245,976 (36)	$8,188,579 (19)	$5,883,430 (33)	$1,546,386 (39)
• Non-Acute Care Inpatient	$250,664 (47)	$100,493 (7)	$162,399 (28)	$544,218 (12)	$257,144 (14)	$247,915 (33)
• Clinical/Medical Day Unit	$1,709,260 (66)	$500,632 (15)	$1,177,040 (35)	$4,006,583 (16)	$2,650,289 (32)	$823,587 (34)
• Emergency Room	$351,426 (62)	$162,644 (15)	$311,782 (32)	$624,783 (15)	$443,991 (29)	$270,082 (33)
• Ambulatory (Take home)	$3,374,471 (33)	$390,091 (7)	$2,380,073 (15)	$6,629,618 (11)	$6,513,875 (17)	$38,853 (16)
Acute Care Inpatient Costs						
Drug Costs/ Acute Patient Day (n=71)	$30.99	$28.54	$26.84	$40.83	$41.75	$21.65
Drug Costs/ Acute Admission (n=71)	$222	$172	$195	$317	$316	$140
NonAcute Care Inpatient Costs						
Drug Costs/ Non Acute Patient Day (n=44)	$6.61	$5.88	$6.82	$6.59	$9.55	$5.38
Drug Costs/ Non Acute Admission (n=43)	$1,449	$972	$1,746	$1,078	$1,611	$1,386
Other Areas						
Clinic/ Medical Day Unit Costs / Clinic, Day Unit Visit (n=60)	$9.92	$4.53	$11.85	$10.88	$10.88	$9.03
Emergency Room Costs / Emergency Room Visit (n=57)	$6.48	$5.27	$6.76	$7.14	$6.92	$6.16

Base: Pharmacy departments providing complete data ( )

Figure E-1. PERCENTAGE OF DRUG EXPENSES BY PATIENT CARE AREA 2001/2002



Base: Respondents providing cost figures (72)

Table E-2. Percentage of Drug Expenses by Patient Care Area 2001/02

Hospitals (n=)	All (72)	Bed Size			Teaching Status	
		100-200 (17)	201-500 (36)	>500 (19)	Yes (33)	No (39)
Acute Care Inpatient	58.7%	61.5%	57.5%	58.7%	59.8%	57.8%
Non-Acute Care Inpatient	5.2%	5.1%	5.9%	4.2%	1.0%	8.8%
Clinical/Medical Day Unit	21.2%	16.8%	24.3%	19.4%	22.0%	20.5%
Emergency Room	8.4%	12.0%	9.3%	3.4%	4.2%	11.9%
Ambulatory (Take home)	6.4%	4.6%	3.1%	14.3%	12.9%	0.9%

Base: Pharmacy departments providing complete data

Table E-3. Changes in Drug Expenses by Patient Care Area - Magnitude of Change and Number of Respondents 2001/02

Hospitals (n=)	All (123)	Bed Size			Teaching Status	
		100-200 (29)	201-500 (66)	>500 (28)	Yes (52)	No (71)
Acute Care Inpatient						
Decrease in drug costs	5.3%	17.5%	2.8%	1.8%	2.4%	7.7%
	(11)	(2)	(7)	(2)	(5)	(6)
Increase in drug costs	12.7%	11.6%	17.6%	6.1%	10.0%	14.7%
	(41)	(12)	(18)	(11)	(17)	(24)
Non-Acute Care Inpatient						
Decrease in drug costs	24.2%	2.0%	31.5%	-	50.0%	15.5%
	(4)	(1)	(3)		(1)	(3)
Increase in drug costs	16.5%	18.1%	19.0%	9.6%	25.8%	12.7%
	(24)	(3)	(15)	(6)	(7)	(17)
Clinic/ Medical Day Unit						
Decrease in drug costs	17.6%	14.5%	10.3%	28.0%	20.0%	17.1%
	(6)	(2)	(2)	(2)	(1)	(5)
Increase in drug costs	24.3%	19.6%	25.0%	28.3%	29.2%	20.2%
	(39)	(9)	(23)	(7)	(18)	(21)
Emergency Room						
Decrease in drug costs	9.6%	2.0%	10.6%	-	7.3%	10.9%
	(8)	(1)	(7)		(3)	(5)
Increase in drug costs	18.7%	20.2%	18.6%	17.6%	13.2%	23.1%
	(34)	(9)	(15)	(10)	(15)	(19)
Ambulatory (Take Home)						
Decrease in drug costs	23.7%	37.0%	19.9%	12.0%	9.5%	29.3%
	(7)	(2)	(4)	(1)	(2)	(5)
Increase in drug costs	24.9%	8.5%	25.0%	46.7%	47.4%	12.5%
	(14)	(4)	(7)	(3)	(5)	(9)
Total Drug Costs						
Decrease in drug costs	3.8%	2.5%	-	5.5%	3.3%	4.0%
	(7)	(4)		(3)	(2)	(5)
Increase in drug costs	13.4%	16.5%	13.4%	11.3%	12.6%	14.2%
	(41)	(7)	(24)	(10)	(20)	(21)

Base: Pharmacy departments providing complete data ( )

Human Resources

Neil Johnson

Human Resource shortages currently affect a number of medical professions. Over the past few years, these shortages have come to affect pharmacy, and particularly hospital pharmacy, in a dramatic fashion. The scope of this problem is believed to be wide-spread and its impact has caused reductions in patient oriented pharmacy services. This year's Annual Report represents one of the few comprehensive measurements of the human resource shortage affecting hospital pharmacy across Canada.

Staffing

In the current pharmacy labour market, noting the distinction between *budgeted and actual* staffing is important. Due to the dynamic nature of pharmacy staffing in this environment, several metrics utilized in this report rely on budgeted staffing as opposed to actual filled positions. As a result, reported figures show increases in staffing at a time when many institutions are reporting significant shortages of skilled workers.

Average budgeted staffing, paid hours per patient day and changes in staff are reported in Table F-1. Overall, reported pharmacy staff paid hours per acute care patient day (excluding residents) increased from 0.68 in the 1999/2000 Annual Report to 0.74 in this year's report. Comparisons at the provincial level showed that the reported paid hours per acute care patient day increased in each province except Alberta. Paid hours per acute patient day increased for hospitals of all bed sizes (Table F-2) except those between 100-200 beds, which decreased from 0.66 to 0.64. Increases were reported for teaching and non-teaching hospitals and for all types of medication delivery systems.

Half of the respondents (62/123) reported an increase in staff positions, 41% (51/123) indicated no net change, and 6% (7/123) reported a decrease in positions. Increases were reported by 46% (33/71) of non-teaching hospital and 56% (29/52) of teaching hospital respondents. These results were similar to those reported in the 1999/2000 Annual Report. Staffing increases were cited as being due to program changes by 52% (32/62) of respondents with increases, due to increased workload by 50% (31/62) and due to revenue opportunities by 3% (2/62). The percentage make up of the budgeted pharmacy department staff remains consistent with the proportions reported previously.

Pharmacists spent approximately 39% of their time in clinical activities (Table F-3); however the time spent in distribution activities reportedly decreased from 49% in the 1999/2000 Annual Report to 46% in this Report. This decrease in drug distribution time was offset by small increases in other non-patient care activities and pharmacy research. Interestingly, pharmacists in non-teaching hospitals spent 5.5% of their time in teaching activities, which is very similar to that reported in teaching hospitals (6.9%).

Salaries

The salaries reported in Table F-4 are reflective of those paid up to March 31, 2002. Salaries continue to be dynamic given the current labour shortages, so these figures may not be comparable to current salary figures. Clearly the trend in many areas of health care in Canada is toward a marked increase in compensation to health care workers. The average expenditure per full time equivalent pharmacy staff position increased to $49,298 from $44,286 reported in the 1999/2000 Annual Report. This increase is well above the increase in cost of living for the period; however this could, in part, be due to changes in the mix of respondents from various provinces.

Respondents reported that salaries for pharmacists increased substantially over the 1999/2000 Annual Report. Increases in average maximum salaries for assistant directors, coordinators, pharmacists (BSc) and pharmacists (MSc/PharmD) increased by between 12.2% and 16.2%. Average maximum reported salaries for technicians increased by 9.9% and the increases were loosely correlated with the complexity of the distribution system employed. Ranges for the salaries of directors are reported in Table F-5. Respondents indicated that 56% of directors earned over $80,000 per year compared to 19% as reported in the 1999/2000 Annual Report. Directors of larger facilities tended to be compensated at higher levels and salaries were reported to increase across all jurisdictions and size of hospitals. The substantial reported increase in salaries for professional staff is reflective of the current shortage of pharmacists in Canada.

Seventy-seven respondents noted the starting salary of a pharmacist (BSc) with no experience to be different than the bottom level of the salary scale. This was reported to be an average of $2,419 per year above the lowest salary level. The teaching hospital average was $3,072 and the average for hospitals with 100-200 beds was $5,672. There was a large variance in the responses with some hospitals reporting starting salaries below the lowest salary level. By contrast the average difference for pharmacy technicians was reported as $69 per year (n=90). Clearly, respondents are using increased salaries for less experienced pharmacists in an effort to recruit new graduates to hospital practice.

Human Resource Shortages

This Annual Report quantifies vacant hours and positions in all job categories. The results are presented in Tables F-9 and F-10. Sixty percent (72/120) of respondents reported having pharmacist position vacancies at March 31, 2002, which was somewhat less than the rate reported in 1999/2000 (69%). The average percent of vacant paid hours for pharmacists reported was 10.3 (range 0-58.2%) with a vacancy rate at March 31, 2002 of 9.7% (range 0–51%). Overall, respondents reported a total of 228 pharmacist position vacancies across Canada on March 31, 2002. The absolute number of reported vacancies will clearly underestimate the true pharmacist human resource gap across Canada, given the response rate to this survey. New Brunswick/PEI respondents reported the highest hourly vacancy rate at 13.1%, and highest positional vacancy rate at 16.6%.

By contrast, only 15% (18/119) of respondents reported having technician vacancies at March 31, 2002. The reported vacancy rate for technicians (based on both vacant hours and positions) was reported to be less than 2%.

Management vacancy rates were reported as 8.7% (paid hours) and 7.6% (positions). The greatest position vacancy rates were reported in Manitoba (19.4%) and Ontario (13.1%).

The average of reported durations of pharmacist vacancies was calculated as 210 days, which has increased significantly from the previous Annual Report (122 days). This average was 180 days in non-teaching hospitals (134 days in 1999/2000), and 257 days in teaching hospitals (110 days in 1999/2000). Vacancy duration was longest in hospitals over 500 beds (258 days) and shortest in hospitals between 100 and 200 beds (121 days). Average management vacancy durations were reported as 53 days. The longer vacancy periods in large teaching hospitals may be in part due to the greater degree of specialized training required in some of these patient care areas. In addition, in some jurisdictions, urban hospitals have experienced a migration of skilled health care staff away from the downtown core to hospitals in suburban communities. Health care workers may be seeking an enhanced and more affordable quality of work and personal life.

Impact on Patient Care Services

Human resource shortages can ultimately lead to reductions in service. Sixty percent of respondents (Table F-7) noted that services have been curtailed in the past year due to staff shortages. In hospitals over 500 beds, this figure was 82% and in teaching hospitals it was 75%. Of those respondents who noted that services had been curtailed, 80% (50/74) responded that direct patient care / clinical services had been curtailed, 59% (44/74) delayed the implementation of an approved program and 49% (36/74) reduced teaching services. Given the need for pharmacists, it is worth noting the reduction in teaching services amongst the respondents. This reduction clearly could have a significant impact on the ability of Faculties of Pharmacy to graduate greater numbers of skilled pharmacists.

Recruitment and Retention

Recruitment and retention strategies should be a standard component of a department's human resources strategy. Specific strategies employed by the respondents of this Annual Report are listed in Table F-8. Interestingly, given the critical labour shortage, 17% (21/123) of respondents indicated that they used no specific recruitment and retention incentives. This was highest in Quebec (44% - 13/36), in non-teaching hospitals (25% - 18/71) and in hospitals between 100-200 beds (24% - 7/29). The most common incentives included paid educational leave (49%), conference opportunities (44%), moving expense allowance (41%), start salaries above usual salary steps (33%) and flexible work hours (28%). Other less traditional measures were employed relatively infrequently. The frequency of use of these incentives did not change from the 1999/2000 Annual Report. Respondents appear to use relatively traditional strategies to retain and recruit human capital and, in addition, pharmacy respondents did not appear to be increasing their efforts to employ incentives as part of their human resource plans. The influence of labour unions/associations in hospitals can limit a hospital's ability to design creative retention and recruitment incentives.

Unions

Respondents to the 1999/2000 survey indicated that pharmacists belonged to a union in 67% (77/115) of hospitals, while respondents this year indicated a unionization rate of 59% (72/123). The change is likely due in part to a higher proportion of responses from Ontario hospitals, which continue to have the lowest unionization rate amongst pharmacists (34% - 13/38). Unionization rates for various groups are represented in F-6. Respondents reported that management staff were unionized in 24% (29/123) of hospitals and pharmacy technicians were represented by a union in 79% (97/123) of hospitals.

Summary

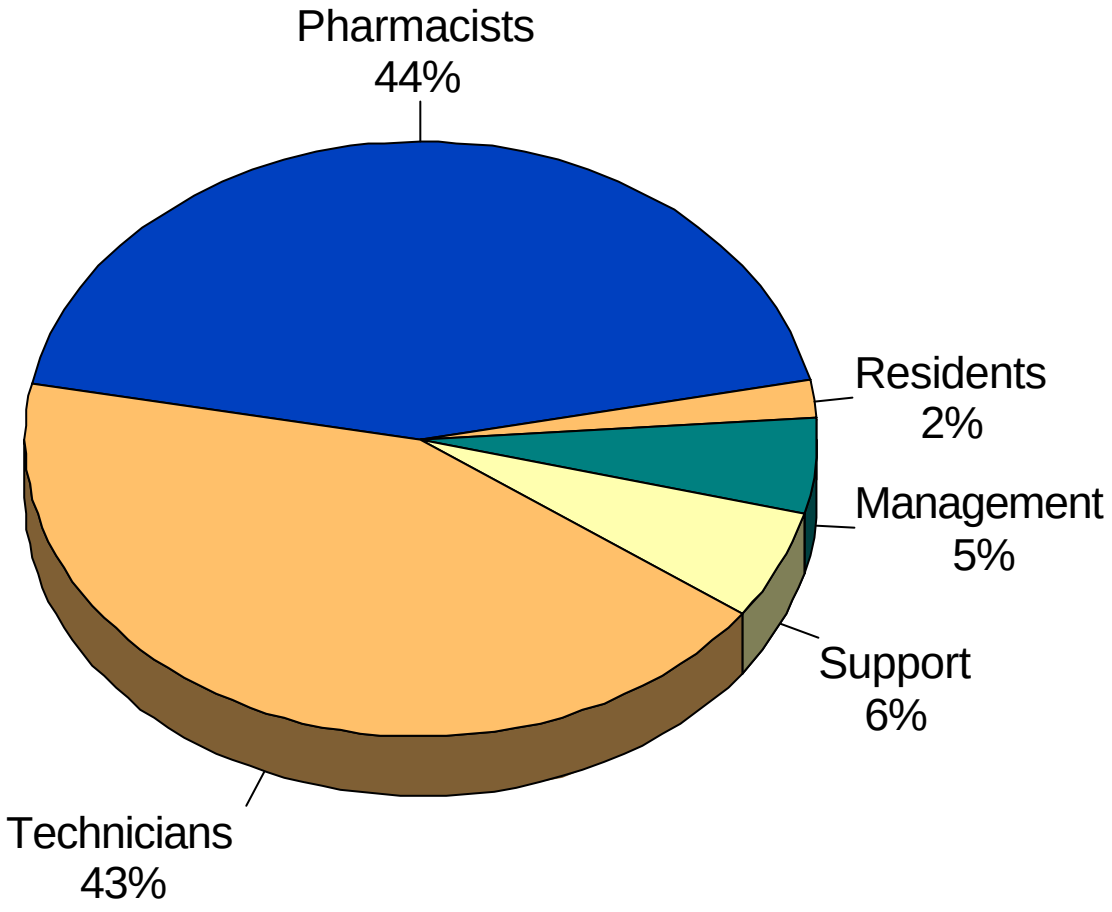
This year's Annual Report illustrates the growing problem of human resource shortages in Canadian hospital pharmacy. These shortages of skilled pharmacists are giving rise to significant increases in compensation and a more focused effort on the part of employers to implement strategies to retain and recruit skilled professionals. Based on trends from previous reports, this skill shortage is likely to continue to grow, further compromising the ability of hospital pharmacies to deliver comprehensive quality patient oriented pharmacy services.

Table F-1. Average Budgeted Pharmacy Staffing and Net Percent Change in Staffing 2001/02

Hospitals (n=)	Canada (123)	Province								
		B.C. (14)	Alta (12)	Sask (4)	Man (6)	Ont (38)	Que (36)	NB/ PEI (7)	NS (4)	Nfld (2)
Pharmacist	17.0	17.7	19.1	26.3	21.4	17.5	14.7	10.8	18.6	23.0
Management	2.1	3.0	2.8	3.3	1.7	2.3	1.2	2.0	2.3	2.0
Technician	16.9	14.6	18.3	25.4	18.9	19.4	13.8	13.6	19.9	19.6
Support Staff	2.4	1.5	6.6	1.8	1.6	2.3	1.9	1.2	2.4	1.8
Residents	0.7	1.3	0.3	1.7	0.3	0.6	0.9	0.1	0.8	0.0
Total FTE	**39.1**	**38.1**	**47.1**	**58.6**	**43.9**	**42.0**	**32.6**	**27.8**	**43.9**	**46.4**
Total beds	418	514	448	518	389	377	409	342	405	679
Paid hours/ Acute Patient Day (n=116) (excluding residents)	0.74	0.73	0.82	0.71	0.71	0.81	0.67	0.58	0.84	0.66
Overall staffing change										
• Net increase	50%	29%	67%	50%	50%	61%	56%	29%	-	-
• Net decrease	6%	14%	-	-	17%	5%	3%	-	-	50%
• No change	41%	57%	33%	25%	33%	29%	42%	71%	100%	50%

Figure F-1. STAFF COMPOSITION OF AVERAGE HOSPITAL PHARMACY DEPARTMENT

2001/02



Base: All respondents (123)

Table F-2. Average Budgeted Pharmacy Staffing by Drug Distribution System 2001/02

	All	Bed Size			Teaching Status		>= 90% Unit Dose	>= 90% Traditional	>= 90% CIVA	>= 90% CIVA & UD	>= 90% CIVA & Trad
Hospitals (n=)	**(123)**	**100-200 (29)**	**201-500 (66)**	**>500 (28)**	**Yes (52)**	**No (71)**	**(29)**	**(32)**	**(62)**	**(21)**	**(12)**
Pharmacist	17.0	4.8	12.9	39.1	27.7	8.9	19.7	11.6	21.2	23.1	16.5
Management	2.1	0.8	1.6	4.3	3.0	1.3	2.3	1.4	2.7	2.7	2.2
Technician	16.9	5.9	12.4	38.6	26.4	9.8	21.2	9.9	21.7	25.4	14.8
Support Staff	2.4	0.7	1.9	5.3	4.1	1.1	3.1	1.4	3.3	3.9	1.8
Residents	0.7	0.03	0.6	1.6	1.6	0.04	1.0	0.7	1.0	1.4	0.9
Total FTE	**39.1**	**12.3**	**29.4**	**88.9**	**62.9**	**21.1**	**47.2**	**24.8**	**50.0**	**56.6**	**36.3**
Total beds	418	148	341	878	552	319	401	320	467	429	439
Paid hours/ Acute Patient Day (n=116) (excluding residents)	0.74	0.64	0.71	0.91	0.89	0.62	0.88	0.63	0.85	0.91	0.74

Table F-3. Proportion of Time Spent by Pharmacists in Each Category 1997/98 - 2001/02

Hospitals (n=)	All (123)	Bed Size 100-200 (29)	Bed Size 201-500 (66)	Bed Size >500 (28)	Teaching Status Yes (52)	Teaching Status No (71)	Previous Surveys 1999/00 (115)	Previous Surveys 1997/98 (122)
Drug distribution (including investigational drugs)	46%	47%	47%	40%	41%	49%	49%	51%
Clinical activities	39%	35%	39%	45%	45%	35%	38%	33%
Teaching	6%	7%	5%	7%	7%	6%	6%	7%
Pharmacy research	2%	2%	2%	2%	2%	2%	1%	NA
Other non-patient care activities	7%	9%	7%	6%	5%	9%	6%	9%

Table F-4. Average Annual Salary by Position 2001/02

Hospitals (n=)	Canada (123)	Province								
		B.C. (14)	Alta (12)	Sask (4)	Man (6)	Ont (38)	Que (36)	NB/ PEI (7)	NS (4)	Nfld (2)
Assistant Director										
Min. Salary (n=30)	$66,318	$71,544	$70,561	$54,688	$71,800	$69,513	$68,527	$45,952	$56,517	-
Max. Salary (n=35)	$77,573	$83,048	$79,119	$76,420	$74,640	$81,538	$80,759	$58,608	$70,647	-
Supervisor/ Coordinator										
Min. Salary (n=52)	$61,695	$70,336	$56,265	$48,128	$62,108	$64,909	$62,918	$48,628	-	$44,749
Max. Salary (n=60)	$72,410	$83,097	$72,167	$56,688	$62,409	$75,238	$72,682	$56,892	-	$59,478
Pharmacist (B.Sc.)										
Min. Salary (n=87)	$52,476	$54,515	$52,448	$45,603	$52,710	$55,615	$49,023	$46,442	$48,642	$41,390
Max. Salary (n=89)	$64,762	$64,452	$65,907	$52,969	$60,413	$68,130	$67,947	$55,529	$59,464	$52,800
Pharmacist (Pharm.D. / M.Sc.)										
Min. Salary (n=57)	$57,529	$63,040	$70,901	$49,896	$51,574	$62,730	$52,946	$58,485	$61,112	-
Max. Salary (n=60)	$70,248	$75,941	$76,115	$59,085	$68,519	$71,088	$69,355	$56,050	$75,669	-
Technician										
Min. Salary (n=107)	$31,604	$39,895	$36,273	$29,981	$28,513	$33,742	$26,515	$26,165	$28,338	$27,363
Max. Salary (n=109)	$36,201	$42,079	$44,224	$31,923	$33,254	$39,602	$31,273	$27,869	$33,073	$30,143
Residency Stipend										
Average (n=37)	$24,688	$38,058	$25,433	$29,500	$20,000	$18,945	$21,423	$30,000	$25,010	-
Overall										
Average Salary $/ FTE (n=105) (without residents)	$49,298	$58,345	$54,884	$42,994	$52,133	$49,354	$46,847	$44,991	$44,541	$46,522

Table F-5. Distribution of Director Salary Ranges 2001/02

Hospitals (n=)	Canada (123)	Bed Size			Province								
		100 - 200 (29)	201- 500 (66)	>500 (28)	B.C. (14)	Alta (12)	Sask (4)	Man (6)	Ont (38)	Que (36)	NB/ PEI (7)	NS (4)	Nfld (2)
$60,000 - $64,999	3%	3%	5%	-	-	-	-	-	3%	-	29%	-	50%
$65,000 - $69,999	5%	10%	3%	4%	-	-	25%	-	5%	-	29%	-	50%
$70,000 - $74,999	9%	24%	6%	-	7%	8%	-	33%	11%	6%	-	25%	-
$75,000 - $79,999	23%	31%	21%	18%	7%	17%	25%	33%	18%	33%	29%	25%	-
$80,000 - $84,999	19%	10%	20%	25%	21%	8%	25%	-	18%	31%	-	-	-
$85,000 - $89,999	7%	7%	6%	7%	7%	-	-	-	8%	6%	-	50%	-
$90,000 - $94,999	11%	7%	12%	11%	7%	25%	-	17%	11%	11%	-	-	-
$94,999 - $99,999	11%	7%	8%	25%	14%	-	-	-	16%	14%	14%	-	-
$100,000+	6%	-	6%	11%	7%	33%	-	-	5%	-	-	-	-
no answer/no Director	7%	-	14%	-	29%	8%	25%	17%	5%	-	-	-	-

Table F-6. Staff Groups Belonging to a Labour Union / Association 2001/02

Hospitals (n=)	All (123)	Teaching Status		Province								
		Yes (52)	No (71)	B.C. (14)	Alta (12)	Sask (4)	Man (6)	Ont (38)	Que (36)	NB/ PEI (7)	NS (4)	Nfld (2)
Pharmacists	72 59%	31 60%	41 58%	13 93%	11 92%	3 75%	2 33%	13 34%	19 53%	6 86%	3 75%	2 100%
Management	30 24%	12 23%	18 25%	11 79%	-	-	-	-	1 47%	2 29%	-	-
Technicians	99 80%	45 87%	54 76%	13 93%	12 100%	3 75%	5 83%	20 53%	34 94%	6 86%	4 100%	2 100%
Support Personnel	85 69%	44 85%	41 58%	8 57%	11 92%	2 50%	2 33%	23 61%	29 81%	5 71%	4 100%	1 50%

Table F-7. Impact of Staff Vacancies on Pharmacy Services Delivered 2001/02

Hospitals (n=)	All (123)
Pharmacies reporting that they had to curtail service due to staff vacancies	74 60%
Impact of staff shortages: (n=74)	
curtailed direct patient care / clinical services	80%
delayed implementation of an approved service	59%
reduced teaching	49%
reduced service hours	27%
curtailed inpatient drug distribution	19%
curtailed outpatient drug distribution	16%
curtailed contract drug distribution	12%
other	14%

Table F-8. Incentives Used for Recruitment / Retention of Pharmacists 2001/02

Hospitals (n=)	All (123)
Paid educational leave / courses	49%
Educational / conference opportunities	44%
Moving expense allowance	41%
Start salaries above the usual salary step	33%
Flexible work hours / schedule	28%
Recruitment fees for staff that bring others	17%
Signing bonuses / incentives	14%
Professional licence payment	10%
Employee discounts	7%
Shortened work weeks	7%
Enhanced benefit packages	5%
Retention bonuses / incentives	4%
Guaranteed personal education allowance	4%
Professional membership fee payments	3%
Other	16%
No incentives	17%

Table F-9. Vacancy Rates – Percent Positions Vacant as of March 31, 2002

Hospitals (n=)	All (123)	Bed Size			Teaching Status		Region				
		100-200 (29)	201-500 (66)	>500 (28)	Yes (52)	No (71)	B.C. (14)	Prai (22)	Ont (38)	Que (36)	Atl (13)
Pharmacists (n=120)	9.7%	6.1%	10.5%	11.7%	10.0%	9.5%	10.4%	8.7%	11.6%	8.2%	9.7%
Management (n=113)	7.6%	4.0%	7.7%	10.6%	8.1%	7.2%	6.1%	9.3%	13.1%	1.1%	6.6%
Technicians (n=119)	1.2%	0.6%	1.5%	1.4%	0.7%	1.7%	1.0%	0.6%	2.8%	0.5%	-
Support Staff (n=95)	2.0%	6.7%	0.3%	3.0%	1.7%	2.4%	1.2%	3.9%	3.5%	0.3%	-
Residents (n=34)	7.4%	-	7.8%	7.4%	8.1%	-	-	5.6%	14.7%	8.3%	-
All positions (n=121)	5.2%	2.9%	5.7%	6.6%	5.4%	5.1%	5.8%	4.5%	6.8%	4.2%	4.1%

Table F-10. Vacancy Rates – Percent Paid Hours Vacant during Fiscal 2001/02

Hospitals (n=)	All (123)	Bed Size			Teaching Status		Region				
		100-200 (29)	201-500 (66)	>500 (28)	Yes (52)	No (71)	B.C. (14)	Prai (22)	Ont (38)	Que (36)	Atl (13)
Pharmacists (n=92)	10.3%	11.7%	10.3%	8.6%	9.3%	10.9%	7.1%	10.3%	12.9%	8.1%	10.7%
Management (n=79)	8.7%	10.6%	7.0%	10.4%	8.6%	8.7%	5.9%	8.9%	15.4%	-	4.2%
Technicians (n=81)	1.5%	2.2%	1.2%	1.1%	1.5%	1.5%	1.5%	0.7%	1.7%	2.3%	-
Support Staff (n=59)	3.7%	10.8%	0.9%	5.1%	2.9%	4.6%	1.5%	6.9%	5.8%	0.7%	-
Residents (n=21)	11.1%	-	12.4%	9.8%	12.2%	-	-	8.3%	22.5%	17.3%	-

Medication Incidents – Special Interest Section

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A medication incident is any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient or consumer. Medication incidents may be related to professional practice, drug products, procedures, and systems, and include prescribing, order communication, product labelling/packaging/nomenclature, compounding, dispensing, distribution, administration, education, monitoring, and use[1].

The 1999 Institute of Medicine (IOM) publication, *To Err is Human*, challenged the health care system to improve the safety of medication use.[2] The report raised the awareness of health care professionals and the general public to concerns regarding patient safety as well as to the opportunities for improvement. Also addressed were the deficiencies of a punitive health care culture that traditionally blames individuals for error and therefore contributes to our inability to discover system problems that increase the probability of a medication incident occurring. The 2002 report of the National Steering Committee on Patient Safety, Building a Safer System: A National Integrated Strategy for Improving Patient Safety in Canadian Health Care[3] reaffirms the need to build a safer Canadian health-care system.

This year's survey collected information on medication incident reporting systems and reduction strategies as a topic of special interest. Our goal in collecting and sharing this information is to provoke further review of medication use systems in Canadian hospitals, and decrease the probability that a patient or health care worker will be harmed by a medication incident.

Reporting Systems

The Canadian Society of Hospital Pharmacists (CSHP) Standards of Practice state, "The pharmacy department shall participate in a medication incident and medication discrepancy reporting program, in accordance with the CSHP Guidelines for Medication Incident and Medication Discrepancy Reporting"[4] Ninety-two percent of all respondents (Table G-1) reported use of a medication incident reporting system within their facilities. Seventy-three % (83/113) of these respondents used an internal reporting system while 25% (28/113) used external systems. Encon®, a system provided by a liability insurance company, was the most commonly reported external system. This trend was particularly noted in Ontario where almost half of the respondents (49%, 17/35) reported using Encon. Two hospitals reported use of an Institute for Safe Medication Practices (ISMP) system, which uses Analyse-ERR®, software developed jointly by ISMP (US) and ISMP-Canada, to facilitate the tracking and analysis of medication incidents within institutions.

Among hospitals reporting use of a medication incident reporting system, the external group data was most commonly made available to was the regional hospital group (22%, 25/113), followed by the hospital insurer (15%, 17/113) and the provincial hospital group (8%, 9/113). Of the nine respondents reporting to a provincial hospital group, six were from the Atlantic region. Seven respondents reported the data was available to other organizations, such as ISMP, and of these, six were from Ontario. This finding may be related to the fact the ISMP-Canada pilot project to test Analyse-ERR® was done in collaboration with Ontario hospitals. The low number of hospitals reporting to external organizations is similar to the U.S. experience where only 17% of hospitals indicated they report medication incidents to the U.S.P. Medication Error Reporting Program and 16% to ISMP[5]. The fundamental purpose of externally reporting medication incidents is to learn from the experience of others and to implement improvements to the medication use system in order to prevent similar occurrences. A proposal for a national reporting system to facilitate this pro-active approach has recently been developed by the Canadian Coalition on Medication Incident Reporting and Prevention.[6]

Ninety-four percent (106/113) of respondents with a medication incident reporting system stated the system was required by their hospital and 26% (29/113) indicated the medication incident system was required by the hospital insurer. Although 12% (14/113) of the respondents reported that they were required to report to their provincial government, and 18% (20/113) reported the medication incident reporting form was mandated by the provincial government, these findings are inconclusive, since not all hospitals within the same province reported these requirements. An internal medication incident form, mandated by their hospital, was used by 84% (95/113) of the respondents with a reporting system.

Written hospital policy requiring staff to submit a report when a medication incident occurs was reported by 88 % of hospitals with a reporting system. Virtually all respondents (94%) with a reporting system indicated medication incident reports included the name of the person who reported the incident. Forty-nine per cent of non-teaching hospital respondents indicated the name of the person involved in the incident is stated on the form compared to 28% of teaching hospital respondents. The individuals who report medication incidents were identified to be nurses (99%, 112/113), pharmacists (95%, 107/113), physicians (21%, 24/113) and others (18%, 20/113), with the "other" category mainly specified to be pharmacy technicians. Physician reporting was more frequent in teaching institutions (34%, 17/50) than in non-teaching institutions (11%, 7/63). Seventy six percent of respondents with a reporting system indicated written hospital policy clearly defined medication incidents to be reported.

Prescribing errors detected in the pharmacy before a medication is dispensed were reported by 21% of the respondents with an incident reporting system, and 27% reported incidents that occur in the pharmacy and are detected during the final check by pharmacy staff. Reporting of both these types of incidents is more common in teaching hospitals and in hospitals with greater than 500 beds. Virtually all respondents with a reporting system (96%,) indicated medication incidents that occur before the medication is administered to the patient and are detected on the patient care area are reported. Similarly, 77% (40/52) of teaching hospital respondents reported general staff could use the medication incident reporting system to report events with the potential for harm compared to 58% (41/71) of non-teaching hospital respondents.

Reporting of "near-misses" and events or circumstances with the potential to cause harm provide valuable insights into the medication use system's vulnerabilities and can guide improvement efforts. It appears many hospitals do not report such events, particularly those detected within the pharmacy. These organizations may be missing valuable information that could be used to proactively identify problems and potentially prevent medication incidents.

Underreporting of medication incidents can be expected if individual blame is the result. A non-punitive medication incident reporting system in which all individuals are expected and encouraged to report incidents without fear of punishment or reprimand can provide important information about the medication use system. This seemed to be the case for the 72% of respondents with a reporting system who agreed (61%, 69/113) or strongly agreed (11%, 12/113) with the statement that medication incidents are openly discussed by staff, without fear of reprisal. However, 27% (31/113) of the respondents disagreed or strongly disagreed, and 33% indicated medication incident reports could be used during performance assessment.

Two thirds of all respondents (68%, 84/123) indicated strategies had been implemented to increase medication incident reporting. Forty-six percent (56/123) used in-service meetings to promote reporting, 38% (47/123) communicated improvements resulting from reporting to staff, 16% (20/123) provided incentives to staff for reporting, 7% (9/123) modified appraisal instruments to reward reporting and 7% (8/123) ensured medication incident reports were non-discoverable (dependent on provincial legislation). The Institute for Health Care Improvement suggests organizations remove de-motivating aspects of error detection by publicly rewarding reports of error, granting immunity from punishment and establishing confidential reporting of errors.[7]

Eighty-five per cent of respondents with a medication incident reporting system reported disclosing medication incidents to patients and / or families. The requirement to inform patients of the occurrence of an unexpected event or incident which may effect their treatment and medical condition is a responsibility under the Code of Ethics for most professions. However, frank discussions of poor outcomes and disclosure to patients and / or families by health care providers may be hampered due to fear of legal consequences**.**

Twenty-nine percent (33/113) of respondents with a medication incident reporting system reported the medication incident report is a part of the permanent patient health record. Twenty-seven of these 33 respondents were from Quebec where this is required by provincial legislation. Provincial legislation also dictates whether an individual medication incident report can be subpoenaed for legal proceedings. Almost half of respondents (44%, 50/113) indicated they did not know if medication incident reports could be subpoenaed for legal proceedings. Following the same trend, 71% (60/85) of respondents with committees responsible for reviewing medication incidents, did not know if the reviews undertaken by the committee could be subpoenaed for legal proceedings.

Medication Incident Review

In the past, medication incident reporting was often highly fragmented. Incidents whose root cause may have been common to processes throughout the hospital were identified and dealt with in professional or departmental silos. A common reporting structure with a clearly identified central core, the multidisciplinary patient safety team, is a start to improving quality in the medication use system. Sixty-nine percent of all respondents (Table G-2) reported a formal committee responsible for the review of medication incidents. Thirty-two per cent of committees have been actively reviewing medication incidents for less than one year, 28% for one to three years, 13% for three to five years and 19% for more than five years. This trend towards the active review of medication incidents by committee is encouraging. The committees identified responsible for medication incident review included the P&T Committee (56%, 48/85), Pharmacy-Nursing (34%, 29/85), Risk Management (28%, 24/85), General Quality Committee (20%, 17/85), Medical Advisory Committee (16%, 14/85) and Medication Quality Committee (13%, 11/85). Thirty-one percent (26/85) reported other committees were responsible for the review of medication incidents. Most of the names of these other committees would suggest they are specific to safe medication practices. Membership on committees included representation from pharmacists (94%, 80/85), nurses (94%, 80/85), physicians (72%, 61/85), risk management (68%, 58/85), senior administrators (45%, 38/85), quality assurance (26%, 22/85), pharmacy technicians (21%, 18/85), information systems (12%, 10/85) and biomedical engineering (1%, 1/85). Some institutions have extended membership to board members, spiritual care managers, infection control officers, human resources, health and safety officers and union representatives.

Reported responsibilities of the committee included: reviewing medication incidents reported internally (91%,77/85), promoting medication use system enhancements (72%, 61/85), recommending policy and procedure for reporting medication incidents (68%, 58/85), responding to medication incidents resulting in serious harm (62%, 53/85), root-cause analysis of medication incidents (55%, 47/85), providing education sessions on medication safety (41%, 35/85), reviewing medication incidents reported in the literature (36%, 31/85) and self-assessment audits (31%, 26/85). One respondent cited an essential role in creating a culture of safety within their organization.

Thirty-five percent (39/113) of respondents with a medication incident reporting system in place (46% of teaching hospital respondents and 25% of non-teaching hospital respondents) calculated medication incident rates. The most common denominators used by those respondents calculating medication incident rates were doses (41%, 16/39), patient days (31%, 12/39), admissions (28%, 11/39) and paid hours – pharmacy technicians (8%, 3/39). Rates of medication incidents within an individual institution can be used to identify trends and

opportunities for system improvement. However, the benchmarking of medication incident rates across the health care system or within an institution is discouraged. A medication incident rate based on voluntary reporting cannot be considered a measure of patient safety as it will vary, depending on the degree of prompt and systematic reporting of medication incidents within the institution[8].

Teaching hospital respondents were more likely than non-teaching hospital respondents to report information on internal medication incidents to general staff health care providers. Large hospitals (>500 beds) were also more likely to report this information than medium size hospitals (201-500 beds) and small hospitals (100-200 beds). Teaching hospital respondents were also more likely to report information regarding published medication incidents to general staff health care providers than non-teaching hospital respondents. Methods used to communicate information to staff included newsletters (42%, 52/123), in-services (38%, 47/123) and formal rounds (12%, 15/123). Bulletin boards, discussions at staff meetings, communication books on wards, hospital E-mail systems or hospital computer internal messaging systems and pharmacy intranet sites were also mentioned. Even though it is encouraging to see medication incident information being shared with general staff, there is ample room for improvement; close to half of all respondents did not provide information on internal medication incidents or on published medication incidents to general staff. Sixty-three percent (78/123) of all respondents received the newsletter of the Institute for Safe Medication Practices (ISMP), a publication containing valuable strategies for medication incident reduction.

The American Society of Health-System Pharmacists (ASHP) Medication-Use-System Safety Strategy document details job responsibilities and associated tasks of a medication-use safety officer as well as proposed membership for an effective medication-use-safety team[9]. Twenty-one percent (26/123) of all respondents reported having specific positions dedicated to monitor medication incidents. Of the 26 respondents who reported specific positions, nurses filled the position in 35% (9/26) of cases and pharmacists in 23% (6/26). Fifty percent (13/26) of respondents listed others as filling the position, with risk managers most often cited. Pharmacist FTEs reported in this position ranged from 0.05 - 0.10, nurse positions varied between 0.05 to 1.00 FTE and others from .10 - 2.00 FTE. Responsibility for medication safety should be considered a routine part of pharmacy practice and the data indicates opportunity for wider pharmacist involvement.

Medication Incident Reduction Strategies

Selection Procurement and Storage

Packaging and labeling that is not clear, distinct and easily differentiated from similarly named or packaged products contribute to the risk of an incorrect medication being dispensed or administered. Label clutter, color, contrast, reminders and warnings, terminology, typeface and package design should be reviewed when purchasing and storing pharmaceuticals.[10] Seventy-one percent of all respondents (Table G-3) reported the potential contribution of packaging and labeling to a medication incident was considered for purchasing decisions. Only 29% considered the same for formulary additions; 7% of small hospitals (100-200 beds), 25% of large hospitals (>500 beds) and 41% of medium size hospitals (201-500 beds).

Floorstock medications can be administered prior to pharmacist review of the medication order and patient profile. ASHP suggests floorstock be approved on the basis of two criteria: capability for harm and medical necessity for immediate access.[11] Thirty-six percent of all respondents indicated additions to floorstock were reviewed against an approved set of defined criteria.

On July 24, 2002, the United States Joint Commission on Accreditation of Healthcare Organizations (JCAHO) issued six National Patient Safety Goals for 2003. One of the six goals is to improve the safety of using high-alert medications with the recommendation to remove concentrated electrolytes (including, but not limited to, potassium chloride, potassium phosphate,

sodium chloride >0.9%) from patient care units.[12] A recent death in Ontario, caused by the inadvertent injection of concentrated potassium chloride, and the resulting inquest, criminal negligence charges and media publicity, have educated the Canadian public.[13] Only eight percent of all respondents reported concentrated potassium chloride was not available on nursing units. Thirty-one percent of all respondents reported it was available on less than 10% of nursing units while greater than half (54%) indicated potassium chloride concentrate was available on greater than or equal to 10% of nursing units. The frequently tragic consequences of administering concentrated potassium chloride, combined with the wide spread availability of pre-mixed intravenous potassium chloride solutions, makes this a patient safety initiative hospitals should strongly consider.

Prescribing or Ordering and Transcribing

Any chance of confusion regarding the medications a patient is to receive post-operatively can be avoided by requiring physicians to prescribe complete medication orders after general anesthesia. Orders to "resume all previous medications" are subject to interpretation and should not be accepted.[14] Eighty-two percent of all respondents (Table G-4) indicated physicians were required to re-prescribe medications after a patient had received general anesthesia.

Pronunciation, dialects, accents and background noise contribute to the risk of a medication order being misunderstood, misinterpreted or incorrectly transcribed when an order is verbally communicated. Thousands of sound alike drug name pairs and easily misheard numbers complicate verbal medication orders. Sixty-four per cent of all respondents indicated verbal and telephone orders are limited to situations in which the patient is at risk for harm AND the physician is unable to physically write an order. Although the goal of eliminating verbal and telephone orders may become more attainable with electronic communication technology, it is unlikely verbal communication of medication orders will be totally eliminated. Therefore, all health care providers should be familiar with practices that encourage accurate and safe verbal communication.[15] The problems associated with verbal medication orders are compounded when a pharmacist accepts a verbal order from a healthcare provider other than the prescriber. Ninety-four percent (49/52) of teaching hospital respondents reported a pharmacist sees the physician order (an original, direct carbon copy, fax or scan) before a medication is dispensed, most of the time, compared to 83% (59/71) for non-teaching hospital respondents.

Eighty-six percent of all respondents reported a formal process was in place to review and approve pre-printed medication orders. Seventy-four percent replied this process extended to infusion dosage charts and guidelines and 56% of all respondents indicated there was a process to review and approve physician order sets (i.e. for computer order entry). Physicians, nurses and pharmacists are inclined to accept pre-printed orders, infusion dosage charts and guidelines and physician order sets as correct. The tendency to question is decreased when healthcare providers assume orders and charts have been previously checked for accuracy. Although these examples of standardization are important tools for minimizing error, it is equally as important there is a process in place to ensure they can be used with confidence.[16]

Abbreviations have a long history of contributing to medication error.[17] The potential for patient harm is well known if the u (units) in an insulin order is interpreted as a zero (0) or if QD (every day) is thought to be QID (four times a day). Goal 2 of the 2003 National Patient Safety Goals (JCAHO) is to improve the effectiveness of communication among caregivers with a recommendation to standardize the abbreviations, acronyms and symbols used throughout the organization, including a list of abbreviations, acronyms and symbols not to use. Only 23% of all respondents indicated they had a designated list of dangerous abbreviations that WERE NOT accepted in the institution.

Drugs used in chemotherapy are frequently associated with error due to the complexity and wide range of dosing regimens. One of the ways in which the risk of a medication incident can be decreased is to ensure chemotherapy orders specify both the dose according to body surface

area or weight and the calculated amount[18], to facilitate an independent double check of the dose calculation by nurses and pharmacists. Of those respondents providing adult chemotherapy, 76% (71/93) reported chemotherapy orders included the total dose as well as a mg/kg or mg/m^2 dose. Small hospitals (100-200 beds) and medium size hospitals (201-500 beds) indicated this practice was in place to a greater extent than large hospitals (>500 beds). Teaching hospital respondents gave a positive response more often than non-teaching hospitals. There were 52 respondents who provided pediatric chemotherapy. Similar to the respondents providing adult chemotherapy, 79% of this group indicated orders for pediatric chemotherapy included the total dose as well as a mg/kg or mg/m^2 dose. Small hospitals had a higher positive response rate than medium size hospitals and large hospitals. Non-teaching hospital respondents gave a positive response more often than teaching hospitals; the reverse of that seen for adult chemotherapy orders.

Computerized physician order entry (CPOE) has come to the forefront of initiatives that may significantly reduce the incidence of medication error and improve patient safety. Only nine respondents indicated CPOE was operational; all were teaching hospitals and represented 17% of all teaching hospital respondents. Seventeen respondents replied they had an approved plan in place to implement CPOE. There was no difference between teaching and non-teaching hospitals in this group, however an approved plan was reported by a greater percentage of larger hospital (>500 beds) respondents. No respondents from Saskatchewan or the Atlantic provinces indicated an approved plan to implement CPOE. A 2001 ASHP national survey indicated 4.3% of American hospitals had prescriber order-entry systems and not surprisingly, larger hospitals reported CPOE significantly more than smaller hospitals.[19]

Of the nine respondents with operational CPOE, three were interfaced with the Pharmacy Information System (PIS). Although the Canadian numbers are small, this contrasts to the ASHP survey that indicated approximately 75% of hospitals with CPOE had links that transferred data from the prescriber order-entry system into the pharmacy computer system. This may be related to the prevalence of hospital wide systems in the United States. The requirement to re-enter orders into the pharmacy computer is redundant and provides an additional opportunity for error. Information systems that allow the interface to occur should be considered an integral component of CPOE. Three respondents reported CPOE integrated with a computerized Clinical Decision Support System. The American survey indicated 91.2% of hospitals required pharmacists verify medication orders entered into CPOE before dispensing from pharmacy. Only four of the nine respondents with operational CPOE indicated a medication order entered via CPOE remained conditional until reviewed by a pharmacist. This finding may be explained by the type of orders that are re-entered into pharmacy systems from the CPOE and whether floorstock medications are included or not.

Preparing, Dispensing and Administration

Status hierarchies in healthcare can act to discourage other healthcare providers from questioning a physician's orders.[20] ISMP reports flawed communication, often precipitated by intimidation, contributes to approximately 10% of serious errors occurring during drug administration. They suggest institutions have a process clearly specifying the steps to be taken to resolve drug therapy conflicts.[21] Fifty-three percent of all respondents (Table G-5) reported a written hospital policy providing nurses and pharmacists the right to refuse to act on a physician order on the basis of patient safety was in place.

Fifty-nine percent of all respondents reported patient allergy status was known prior to a medication order being dispensed from pharmacy most of the time and 34% reported it was known some of the time. Lesar et al have reported that 12.1% of prescribing errors occurring in a hospital were due to the prescriber failing to recognize a patient's allergy to the prescribed medication class.[22] This emphasizes the importance of a pharmacist review of the patient's profile information for detection of potential allergic reactions prior to dispensing the patient's medication.[23]

Checking the actual drug against the physician order (not against the patient profile entry or the computer generated label) before a patient specific medication is dispensed for the first time introduces a double check into the dispensing function. Seventy-eight percent of all respondents reported use of this check most or some of the time. The use of automated dispensing units in patient care areas would influence the response to this question.

Heparin, insulin, morphine and inotropes are considered high alert medications with the consequences of error often more severe than with other drugs. Standardizing infusion concentrations is one strategy that can help decrease the possibility of calculation errors.[24] It has been implemented the most extensively for heparin, with 82% of all respondents stating a single standard infusion concentration is used in at least 90% of cases. The availability of pre-mixed intravenous heparin solutions has probably contributed to this wide spread practice. Fifty-four percent of teaching hospital respondents indicated a standard infusion concentration was used for insulin in at least 90% of cases compared to 39% (28/71) of non-teaching hospital respondents. Thirty-nine percent of all respondents indicated a standardized infusion concentration was used for morphine, with no appreciable difference between teaching and non-teaching hospital respondents. Sixty-one percent of all respondents indicated this practice in place for inotropes. Medium size hospitals (201-500 beds) reported the greatest use of single standard infusion concentrations for inotropes, morphine and insulin.

Vincristine for intravenous injection, dispensed in minibags, can prevent inadvertent intrathecal administration.[25] Eighty-nine respondents reported the preparation of vincristine. Thirty-one percent (28/89) reported they prepared and dispensed vincristine in an intravenous minibag or infusion bag. Although other procedures may be in place to reduce the occurrence of this tragic medication incident, the use of forcing functions (it is unlikely the contents of a minibag would be administered intrathecally) should be seriously considered.

Monitoring

Eighty-three percent of all respondents (Table G-6) indicated defined monitoring criteria for the administration of patient controlled analgesia (PCA) had been established and implemented. Narcotics are considered high alert medications, as described previously, and defined monitoring criteria can decrease the risk of harm associated with errors in concentration, rate, drug and route as well as third person PCA activation.

In order to direct efforts to decrease occurrence of medication incidents and increase patient safety, the problems with drug products, work circumstances, procedures, pieces of equipment, etc, must be identified. Voluntary reporting of medication incidents and near misses is one method used to gather this information. Twenty-four percent (29/123) of all respondents reported using random observation to monitor the occurrence of medication incidents, 15% (18/123) reported the use of selective monitoring of laboratory tests, and 9% (11/123) indicated chart review based on the use of antidotes was used. Fifty-eight percent (71/123) of all respondents indicated no other methods were used to monitor the occurrence of medication incidents.

The availability of relevant drug information for all healthcare providers connected to the medication use system is an important element of reducing the probability of error. Drug information was reported as being provided to all nursing units where the drug would be used prior to it being administered by 87% (106/123) of all respondents for new drugs added to the Formulary if information was not listed in the CPS; by 79% (97/123) for non-formulary drugs if information was not listed in the CPS; by 83% (101/123) for investigational drugs; and by 77% (95/123) for drugs obtained by the special access program.

Bar coding has been identified as a technology that can be used to ensure the accuracy of medication administration, improve efficiencies within the medication use process and improve overall patient safety.[26,27] Thirteen respondents, primarily from larger, teaching hospitals, reported bar coding was used in the medication use system. The most common application of bar coding

reported was to verify stocking of automated dispensing cabinets. Bar coding was also used to return doses to inventory in the pharmacy, verify stocking of unit dose bins and verify drug selection prior to dispensing from the pharmacy. No one reported bar coding was used in the medication administration process, either to verify drug selection prior to patient administration or to identify the patient during medication administration. A 1999 ASHP survey reported 8.2% of institutions used machine readable coding. Similar to Canada, the majority of use was for drug processing and dispensing. Only 14% using machine readable coding indicated use for medication verification at the bedside and only 11% for documentation in the medication administration record.[28] Standardized bar coding of all pharmaceutical product packages, including unit dose, would enable the broader use of this technology in the medication use system.

There were 114 respondents who indicated a pharmacy computer system was in use. Pharmacy computer systems were widely used to check for allergies (91% of respondents using computer systems), therapeutic duplicates (89%) and drug-drug interactions (88%). Fifty-two percent of non-teaching hospital respondents and 30% of teaching hospital respondents stated the pharmacy computer system was used to check drug-lab values (dose adjustments).

The capability of a computer system to issue maximum dose alerts automatically upon order entry is a valuable tool in decreasing the risk of error associated with human performance. One quarter of respondents with a pharmacy computer system indicated it was used to issue maximum dose alerts automatically upon order entry. Seventy-one percent (20/28) of these respondents indicated maximum dose alerts for adults, 68% (19/28) for pediatrics, 61% (17/28) for neonates and 50% (14/28) for oncology. Ten percent stated the pharmacy computer system tracked cumulative doses and was used to issue maximum cumulative dose alerts automatically upon order entry. The potential of pharmacy computer systems to contribute to improved patient safety seems to be underutilized. At a very minimum, systems should be reviewed for their ability to issue maximum dose alerts upon order entry for those drugs commonly used in neonates and pediatrics and all drugs used in oncology.

Summary

Unit dose medication delivery, centralized intravenous additive programs, pharmacy generated computerized medication administration records and progressive clinical services have demonstrated pharmacists are leaders in improving the safety of the medication use system. The exploding number of marketed drugs, the complexity of medication therapy, challenging human resource issues and changing environments within our institutions continue to provide us with opportunities for leadership in patient safety initiatives.

The systematic review of the deficiencies in our medication use systems is an important step in quality improvement and patient safety. Medication incident reporting is a valuable tool when used to detect medication use system deficiencies and guide improvement efforts. However, in order for this tool to be its most useful, healthcare providers must be willing to report medication error. A cultural change is suggested when close to one-third of all respondents indicate staff fear reporting medication incidents. Although it is encouraging to see an increasing number of committees responsible for medication incident review, only one-third of these committees reviewed incidents reported in the literature, an important element in pro-actively reducing medication incidents. The survey data indicates there are medication incident risk reduction strategies, published in the literature and suggested by organizations concerned with patient safety, that have not been extensively implemented in Canadian hospitals. The widely publicized hazards with concentrated potassium chloride and the potential safe strategy of using pre-mixed potassium chloride is the most notable example. The very limited use of bar coding and computerized physician order entry, system improvements that may dramatically enhance patient safety, was the domain of a few larger, teaching hospitals.

The data should incite pharmacists to accept the challenge to actively analyze medication use systems and work collaboratively with other health care providers to ensure those systems optimally provide our patients with the safest care possible.

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Table G-1. Reporting Systems for Medication Incidents 2001/02

	All	Bed Size			Teaching Status	
Hospitals (n=)	(123)	100-200 (29)	201-500 (66)	>500 (28)	Yes (52)	No (71)
A medication incident reporting system is in use	113 92%	27 93%	60 91%	26 93%	50 96%	63 89%
For respondents with medication incident systems (n=113)						
A written hospital policy requires staff to **submit a report** when a medication incident is detected	100 88%	24 89%	54 90%	22 85%	45 90%	55 87%
The name of the **person reporting** the incident is on the form	106 94%	25 93%	57 95%	24 92%	48 96%	58 92%
The name of the **person involved** in the incident is on the form	45 40%	14 52%	21 35%	10 38%	14 28%	31 49%
Written hospital policy provides clear **definitions of medication incidents** that are to be reported	86 76%	21 78%	46 77%	19 73%	39 78%	47 75%
Incidents that occur during **prescribing** and are detected in the pharmacy before dispensing are reported						
Most of the time (>=90%)	6 5%	3 11%	2 3%	1 4%	2 4%	4 6%
Some of the time (< 90%)	18 16%	2 7%	9 15%	7 27%	12 24%	6 10%
Incidents that occur in **pharmacy** and are detected during the **final check** prior to the medication leaving pharmacy are reported						
Most of the time (>=90%)	7 6%	2 7%	4 7%	1 4%	5 10%	2 3%
Some of the time (< 90%)	24 21%	2 7%	10 17%	12 46%	17 34%	7 11%
Incidents that occur **before medication is administered** to patient and are detected in patient care area are reported						
Most of the time (>=90%)	57 50%	15 56%	27 45%	15 58%	27 54%	30 48%
Some of the time (< 90%)	52 46%	11 41%	31 52%	10 38%	22 44%	30 48%
Medication incidents are reported and openly discussed by staff **without fear of reprisal**	81 72%	19 70%	45 75%	17 65%	36 72%	45 71%
Medication incident reports can be used during **performance appraisals**	37 33%	14 52%	19 32%	4 15%	13 26%	24 38%
Medication incidents are **disclosed to patients and/or families**						
Most of the time (>=90%)	20 18%	4 15%	11 18%	5 19%	9 18%	11 17%
Some of the time (< 90%)	76 67%	16 59%	43 72%	17 65%	37 74%	39 62%

Table G-2. Medication Incident Review 2001/02

Hospitals (n=)	All (123)	Bed Size 100-200 (29)	Bed Size 201-500 (66)	Bed Size >500 (28)	Teaching Status Yes (52)	Teaching Status No (71)
Designated committee responsible for medication incident review	85 69%	18 62%	46 70%	21 75%	44 85%	41 58%
For respondents with committees (n=85)						
Time period the committee has been actively reviewing medication incidents						
Less than 1 year	27 32%	5 28%	13 28%	9 43%	15 34%	12 29%
1 - 3 years	24 28%	4 22%	13 28%	7 33%	13 30%	11 27%
3 to 5 years	11 13%	2 11%	8 17%	1 5%	8 18%	3 7%
More than 5 years	16 19%	4 22%	10 22%	2 10%	6 14%	10 24%
Medication incidents **rates are calculated** (n=113)	39 35%	4 15%	22 37%	13 50%	23 46%	16 25%
Information regarding **internal medication incidents** is routinely provided to general staff healthcare providers	67 54%	11 38%	36 55%	20 71%	36 69%	31 44%
Information regarding **published medication incidents** is routinely provided to general staff healthcare providers	57 46%	9 31%	33 50%	15 54%	31 60%	26 37%
Specific **position dedicated to monitor medication incidents**, perform analysis and suggest system improvements	26 21%	7 24%	14 21%	5 18%	10 19%	16 23%

Table G-3.Medication Incident Reduction Strategies - Selection, Procurement, Storage 2001/02

Hospitals (n=)	All (123)	Bed Size 100-200 (29)	Bed Size 201-500 (66)	Bed Size >500 (28)	Teaching Status Yes (52)	Teaching Status No (71)
Potential contribution of packaging and labelling to a medication incident is formally considered for						
• formulary additions	36	2	27	7	16	20
	29%	7%	41%	25%	31%	28%
• purchasing decisions	87	21	48	18	38	49
	71%	72%	73%	64%	73%	69%
Additions to floor stock are reviewed against an approved set of defined criteria	44	11	20	13	19	25
	36%	38%	30%	46%	37%	35%
Concentrated Potassium Chloride is available on						
• >=10% of nursing units	67	20	29	18	30	37
	54%	69%	44%	64%	58%	52%
• < 10% of nursing units	38	5	26	7	17	21
	31%	17%	39%	25%	33%	30%
• not available on nursing units	10	2	5	3	5	5
	8%	7%	8%	11%	10%	7%

Table G-4 Medication Incident Reduction Strategies - Prescribing, Ordering, Transcribing 2001/02

		Bed Size			Teaching Status	
Hospitals (n=)	All (123)	100-200 (29)	201-500 (66)	>500 (28)	Yes (52)	No (71)
Physicians required to **re-prescribe medication orders** after patient has received general anaesthesia (resume same medications is not accepted)						
Most of the time (>=90%)	78 63%	20 69%	38 58%	20 71%	33 63%	45 63%
Some of the time (< 90%)	23 19%	4 14%	13 20%	6 21%	12 23%	11 15%
Verbal and telephone orders are limited to situations in which patient is at risk for harm and physician is unable to physically write an order						
Most of the time (>=90%)	50 41%	15 52%	24 36%	11 39%	23 44%	27 38%
Some of the time (< 90%)	28 23%	7 24%	15 23%	6 21%	11 21%	17 24%
Pharmacist sees physician order (original, direct carbon copy, fax or scan) **before medication is dispensed from pharmacy** (i.e. verbal requests from another healthcare provider are not accepted).						
Most of the time (>=90%)	108 88%	27 93%	56 85%	25 89%	49 94%	59 83%
Some of the time (< 90%)	7 6%	2 7%	2 3%	3 11%	3 6%	4 6%
There is a formal process to review and approve						
• Pre-printed physician orders	106 86%	24 83%	56 85%	26 93%	46 88%	60 85%
• Physician order sets (i.e. for computer order entry)	69 56%	15 52%	40 61%	14 50%	33 63%	36 51%
• Infusion dosage charts and guidelines	91 74%	22 76%	48 73%	21 75%	37 71%	54 76%
There is a **designated list of dangerous abbreviations** that are **not** accepted	28 23%	7 24%	15 23%	6 21%	13 25%	15 21%
Orders for chemotherapy include the total dose as well as mg/kg or mg/m2						
• For Adults (n=93)	71 76%	14 82%	40 80%	17 65%	32 80%	39 74%
• For Paediatrics (n=52)	41 79%	14 93%	18 72%	9 75%	18 72%	23 85%
Computerized physician order entry (CPOE)						
• Approved plan to implement	17	1	8	8	8	9
• Operational	9	3	3	3	9	-
Interfaced with Pharmacy Information System	3	-	1	2	3	-
Integrated with computerized Clinical Decision Support System	3	1	1	1	3	-
Medication order entered via CPOE remains conditional until reviewed by a pharmacist	4	1	1	2	4	-

Table G-5 Medication Incident Reduction Strategies - Preparing, Dispensing, Administration 2001/02

		Bed Size			Teaching Status	
Hospitals (n=)	All (123)	100-200 (29)	201-500 (66)	>500 (28)	Yes (52)	No (71)
Written hospital policy providing nurses and pharmacists **the right to refuse** to act on a physician order on basis of patient safety	65 53%	12 41%	37 56%	16 57%	26 50%	39 55%
Patient allergy status is known prior to a medication order being dispensed						
Most of the time (>=90%)	72 59%	17 59%	37 56%	18 64%	30 58%	42 59%
Some of the time (< 90%)	42 34%	11 38%	21 32%	10 36%	21 40%	21 30%
Before a patient specific medication is **dispensed FOR THE FIRST TIME**, the actual drug is checked against physician order						
Most of the time (>=90%)	87 71%	26 90%	45 68%	16 57%	37 71%	50 70%
Some of the time (< 90%)	9 7%	-	5 8%	4 14%	4 8%	5 7%
Single standard infusion concentrations are used in at least 90% of cases for						
• heparin	101 82%	22 76%	55 83%	24 86%	42 81%	59 83%
• insulin	56 46%	11 38%	35 53%	10 36%	28 54%	28 39%
• morphine	48 39%	10 34%	34 52%	4 14%	19 37%	29 41%
• inotropes	75 61%	17 59%	43 65%	15 54%	31 60%	44 62%
Pharmacies dispensing Vincristine (n=89)						
Vincristine is prepared and dispensed in an intravenous minibag, or infusion bag (NOT in a syringe)	28 31%	3 20%	15 31%	10 40%	15 34%	13 29%

Table G-6 Medication Incident Reduction Strategies - Monitoring 2001/02

Hospitals (n=)	All (123)	Bed Size 100-200 (29)	Bed Size 201-500 (66)	Bed Size >500 (28)	Teaching Status Yes (52)	Teaching Status No (71)
Defined criteria for administration of Patient Controlled Analgesia have been established and implemented	102 83%	23 79%	55 83%	24 86%	45 87%	57 80%
Bar coding is used in the medication system to:	13 11%	-	6 9%	7 25%	11 21%	2 3%
• verify drug selection prior to dispensing from the pharmacy	1	-	1	-	1	-
• verify drug selection prior to patient administration	-	-	-	-	-	-
• identify the patient during medication administration	-	-	-	-	-	-
• return doses to pharmacy inventory	5	-	3	2	4	1
• verify unit dose bin stocking	3	-	2	1	3	-
• verify automated dispensing cabinet stocking	6	-	2	4	5	1
A **pharmacy computer system** is being used for checking	114 93%	27 93%	59 89%	28 100%	50 96%	64 90%
Checking for: (n=114)						
• allergies	104 91%	26 96%	52 88%	26 93%	45 90%	59 92%
• drug - drug interactions	100 88%	23 85%	52 88%	25 89%	41 82%	59 92%
• therapeutic duplicates	101 89%	26 96%	55 93%	20 71%	41 82%	60 94%
• drug - lab values	48 42%	11 41%	27 46%	10 36%	15 30%	33 52%
• maximum dose alerts	28 25%	8 30%	15 25%	5 18%	14 28%	14 22%
• maximum cumulative dose alerts	11 10%	1 4%	5 8%	5 18%	10 20%	1 2%

A Program Breakdown of Benchmark Indicators For Pharmacy Staffing and Drug Costs

Kevin W. Hall, Pharm. D.

Introduction

For over fifteen years, the Hospital Pharmacy in Canada Survey has been producing data that has helped pharmacy managers to respond more knowledgeably to questions concerning their staffing and drug costs. The usefulness of the data has been improved over the years by creating subsets of the overall data, that grouped hospitals based on size, teaching status and the type of drug distribution system in use. However, the usefulness of the data for interfacility comparisons remained limited by the fact that data from hospitals within the subsets were combined, regardless of the mix of patient services and types of pharmacy services being delivered. This meant that a diverse group of facilities, such as hospitals providing primarily acute care services, hospitals providing significant amounts of long-term care services, pediatric hospitals, and psychiatric hospitals were all included in the same pool of data. Similarly all of the data from within a single hospital was being rolled up despite the fact that many hospitals, particularly the larger ones, operated a number of quite distinct programs to serve different patient groups within their facility.

In the last two Hospital Pharmacy in Canada Survey Annual Reports, the results of a new approach to developing benchmark indicators for pharmacy departments in Canada were first reported. The new benchmarking section was an attempt to identify the staffing and drug costs incurred by pharmacy departments in the delivery of services to specific inpatient and outpatient programs, such as critical care, pediatrics, outpatient prescription services, and mental health. In addition, it attempted to capture the resources committed to those indirect patient care programs that are operated by some but not all pharmacy departments, such as a regional drug information centre or an investigational drug service.

An important premise underlying this benchmarking approach is that there should be a reasonable degree of consistency when the pharmacy resources required to service the same type of patient group, or to deliver a similar type of pharmacy service, are compared between facilities. The assumption underlying this premise is that a similar standard of care is being delivered at the facilities being compared; an assumption that is probably not always correct. Nonetheless, the argument has been made by pharmacy managers that only by breaking down a pharmacy department into its sub-component parts, and identifying the resources committed to each, is it possible to create more refined and useful data on which to attempt inter-facility resource-utilization comparisons. In the future it would be ideal if this type of program-specific benchmarking analysis could be combined with accepted outcome measures, so that both quality of care and efficiency of service delivery could be assessed.

Although justification of the pharmacy resources is an important reason for developing improved pharmacy benchmark indicators, it is not the sole use for program-specific pharmacy data. Planning for any new or expanded patient care program is greatly facilitated when there is some knowledge of the pharmacy staffing and/or drug costs being incurred at other facilities to service the same type of patient group, or to operate the same type of pharmacy program. Likewise, with all of the program consolidations, program transfers and downsizing that are occurring as a result of the regionalization of health care, it is important to have data on which to base the amount of resources that will be removed from one site and transferred to another. Applying the existing overall departmental average for staffing (e.g. paid hours per patient day), or drug costs (e.g. drug cost per patient day), will underestimate the resources associated with pharmacy resource-intensive programs, such as oncology, critical care and pediatrics. On the reverse side, such an approach would overestimate the resources required for programs that are less pharmacy resource-intensive, such as long term care or mental health. Thus the availability of data on the

pharmacy resources required to service defined patient groups was felt to be an important planning tool that could be made available to pharmacy managers as a result of this programmatic benchmarking analysis.

The new program-based benchmarking analysis, utilized in the last two surveys of hospital pharmacy in Canada, created new program-specific subsets of the overall data. The results demonstrated that the variability in pharmacy resource utilization was reduced when this program-specific methodology was used. It was therefore decided to continue this analysis in the 2001/2002 report.

Methods

The benchmarking section of the survey consisted of five sections. In Section I, survey respondents were asked to provide data on total pharmacy staffing for their entire pharmacy operations, total inpatient and outpatient drug costs, total hospital beds, total patient days and the type of drug distribution system in use at their hospital. In Section II respondents were asked to provide similar data for subgroups of inpatients such as critical care patients, bone marrow transplant patients, and long term care patients. The survey instructions for this section requested that the pharmacy resources associated with each distinct inpatient program be reported separately. In Section III, respondents were asked to provide data for any outpatient pharmacy programs operated by their hospitals, such as outpatient prescription dispensing and home parenteral nutrition. In Section IV, respondents were asked to provide data on any other unique pharmacy services that they operated, such as a regional drug information service, investigational drug services and contract services to external organizations. Section V was intended to represent the remaining pool of inpatient acute care patient groups such as family medicine, internal medicine, and general surgery. If the survey was completed correctly, the inpatient beds, inpatient days, pharmacy staffing resources and drug costs in Section V would equal those in Section I minus those in Sections II through IV.

The Editorial Advisory Board for the survey recognized that the type of survey being proposed would be time-consuming for respondents to complete, and would be time-consuming and challenging for the Board to analyze. As a result the Board decided to limit the distribution of the survey to those hospitals that were most likely to derive benefit from this type of program-based breakdown of their overall hospital data. Specifically, the facilities selected to receive the new benchmarking section of the survey were facilities that were identified in the Board's database of Canadian hospitals as having over 300 acute care beds, or which were identified as a pediatric hospital. The facilities with more than 300 beds were chosen because it was believed that hospitals in this group were most likely to operate a variety of different programs that could be assessed in terms of their different resource utilization patterns. Pediatric hospitals were selected for inclusion in the survey because the delivery of pediatric pharmacy services was shown in the previous two benchmarking surveys to require significantly greater amounts of pharmacy staffing than the delivery of similar adult care programs. It was also anticipated that specialized pediatric hospitals might show a quite different profile of resource utilization than would a small pediatric service within a primarily adult care facility.

In the 2001/2002 survey, the benchmarking section was distributed to 60 "adult" hospitals with more than 300 beds, and to six pediatric hospitals. All provinces in the country were represented in the distribution list, with the exception of Prince Edward Island which did not have any hospitals that met the distribution criteria.

The returned benchmarking surveys were individually reviewed by the author of this section of the survey. Direct contact was made with many respondents to clarify data discrepancies. Based on the data submitted, indicators such as paid hours per patient day and drug costs per patient day were calculated for each program. To the extent possible, efforts were made to insure that there was consistency in the program data provided by the different facilities. For example, some

facilities were able to provide a more detailed breakdown of their programs than were the majority of other facilities. When this was the case, the data for a number of programs reported by that facility were combined to create a program grouping that was similar to that reported by other facilities. An example of this would be the combining of separate data provided for general medicine and general surgery, since most facilities could not provide that breakdown.

The program-specific indicators were then subjected to calculations to determine the mean, median, standard deviation, minimum and maximum values for each indicator. The spreadsheet was set up to calculate this data for all hospitals, as well as for subgroups of hospitals based on their size and the type of drug distribution system reported to be in use within each facility.

Results and Discussion

Thirty individual hospitals or regions, representing a 45% response rate, returned the benchmarking section of the survey. Two of these responses were eliminated from the analysis because inadequate data were submitted to enable the calculation of indicators (one facility), or because the facility fell well below the 300 acute care bed cutoff (one facility). Of the remaining 28 responses, 15 were from adult hospitals with more than 500 acute care beds, 9 were from hospitals with between 300 and 500 acute care beds, and four were from pediatric hospitals. Each province is represented in the results with the exception of Prince Edward Island and Newfoundland.

The completeness of the submitted data varied between hospitals. Each useable data element was included in the analysis, regardless of whether or not the respondent could provide all of the data requested in the survey. For many of the calculated indicators the number of reporting hospitals was high enough to make the data quite meaningful. For other indicators the number of reporting facilities was quite small and caution is warranted with respect to the interpretation and use of that data.

Adult Hospitals

Table H-1 shows the results of the analysis of human resource and drug cost data for the 24 adult hospitals before and after the resources for specialized programs were extracted. The "before adjustment" figures represent the overall pharmacy data submitted in Section I of the survey, and the "after adjustment" figures represent primarily the general inpatient medical and surgical programs that remained in Section V of the survey. Other pharmacy data that would roll up in this "after adjustment" section would include any staffing committed to core pharmacy department functions such as purchasing, inventory management, wardstock distribution, office functions and departmental management. The "after adjustment" figures are felt to represent a fairly homogeneous group of pharmacy services, based on the assumption that respondents have identified the high and low pharmacy resource programs in Sections II to IV of the survey. This grouping should be quite similar to an acute care community hospital that provides services primarily to general medicine and surgery patients. Patient groups requiring specialized pharmacy services and patient groups requiring little in the way of pharmacy services are no longer part of the patient group that is being compared.

The data is presented for all 24 adult hospitals and is also reported separately for hospitals with more than 500 beds and for hospitals with 300 to 500 beds. The after adjustment data shows much less variability than the before adjustment data. The variability diminishes even further when hospital size and type of drug distribution system are used to sub-categorize the data. It is worthwhile noting that both the minimum and maximum values are usually brought closer to the mean value by this benchmarking analysis methodology. Hospitals that had reported very low staffing and drug costs in Section I of the survey were usually found to be operating patient care programs, like long term care beds, that consume lower than average amounts of resources. When those low-resource programs were extracted, the paid hours per patient day and the drug

costs per patient day increased for the remaining beds. On the other extreme, hospitals that had reported very high paid hours per patient day or very high drug costs per patient day were usually found to be operating a number of specialized resource-intensive pharmacy programs. When those resource-intensive programs were extracted, the paid hours per patient day and drug costs per patient day decreased for the remaining beds.

The decrease in variability can be demonstrated by examining the paid hours per patient day data. The overall data show that the 24 facilities had a five-fold variation in their paid hours per patient day, from 0.24 to 1.31. The breakdown of facilities by hospital size and type of drug distribution system, which has been part of the reported survey data for a number of years, reduces that variability. For example the range for hospitals with more than 500 beds, using a unit dose/IV admixture system of drug distribution, is 0.46 to 1.31 paid hours per patient day, a three-fold variability. The benchmarking adjustment further reduces the range to 0.51 to 0.96 paid hours per patient day, a two-fold variability.

The pharmacy manager who was asked to justify why their pharmacy department appears to have higher staffing indicators than comparable hospitals could use the benchmarking data reported in Table H-1 to determine if that assumption was in fact true. The manager could extract the resources associated with resource-intensive programs and compare the "after adjustment" figure for their hospital with that for the hospital grouping in Table H-1 that is most similar to their own in size and type of drug distribution system. This might well demonstrate that their hospital's pharmacy staffing was quite appropriate in relation to other facilities when this programmatic approach to benchmarking was used.

Table H-1 also shows before and after adjustment drug costs per patient day. It is clear that there is large variability in drug costs per patient day when overall drug costs are used to create drug cost indicators. Even adjustment for the size of the hospital and the type of drug distribution system leaves a large amount of variability. In contrast, the mean after adjustment drug costs per patient day are more similar, regardless of the size of hospital or type of drug distribution system in use. It is also of interest that the after adjustment drug costs per patient day are, on average, only about one-half of the before adjustment figures. This indicates that specialized inpatient and outpatient pharmacy programs tend to be associated with the most costly drug therapies. This is probably not surprising to most managers who have had to deal with the high cost therapies used in areas such as oncology, critical care, and organ transplant programs.

The impact of the program-based benchmarking approach for 2001/2002 is the same as the results from the previous two benchmarking surveys. Not surprisingly, however, there has been a general upward trend in both pharmacy paid hours per patient day and in drug costs per patient day. With respect to the pharmacy staffing indicator of paid hours per patient day, there was an increase between 5% and 10% in the before and after adjustment figures for all adult hospitals and for hospitals with traditional/mixed drug distribution systems. Interestingly, there was a small decrease in paid hours per patient day for the group of facilities with >90% unit dose and centralized IV admixture systems. On examination, a number of facilities that were in the traditional/mixed drug distribution group in the last survey have moved to the unit dose/CIVA group in the present survey, with only small changes in their staffing indicator of paid hours per patient day. The author is aware that several of these facilities have made the transition to unit dose with the use of automated drug distribution technologies, specifically Pyxis cabinets. It is quite possible that we are seeing a positive impact of these automated technologies on the labour requirements for operating unit dose systems.

Drug costs per patient day were also higher in the 2001/2002 results than they were in the 1999/2000 results. The increases were generally in the 20% to 30% range and were reasonably consistent in both the before adjustment figures and the after adjustment figures.

Pediatric Hospitals

In Table H-2, similar data is provided for the four pediatric hospitals. The numbers of respondents is small and the results must be viewed from that perspective. However, as was the case for the adult hospitals, the program-based benchmarking analysis reduced the variability between facilities with respect to both their staffing and drug cost indicators. As was demonstrated in the last two benchmarking surveys, it is clear that the pharmacy staffing required to service pediatric patients is substantially higher than that required for adult pharmacy services. For both unit dose/IV admixture hospitals, and for traditional/mixed distribution system hospitals, the paid hours per patient day are approximately twice that reported by adult hospitals. As compared to the 1999/2000 results, pharmacy paid hours per patient day have increased approximately 10%.

Drug costs for the pediatric hospitals were about 30% higher in 2001/2002 than they were in 1999/2000.

It should be noted that one of the three unit dose/IV admixture pediatric facilities is operated as a partially separate component of a larger pharmacy department in a multi-site complex. As such it receives much of its core services, such as overall management, purchasing and inventory control, from the central department. Although the staffing for these services was apportioned to the pediatric facility for the purposes of this analysis, it is uncertain how this would compare to the same services delivered in a completely stand-alone pediatric hospital. It is unknown if this may have contributed to the lower adjusted paid hours per patient day (1.06) that this unit dose/IV admixture pediatric facility demonstrated, as compared to the other two facilities in this group (2.24 and 2.5).

Specialty Programs, Adult Hospitals

In Table H-3, information on staffing and drug costs is presented for a number of inpatient and outpatient specialty programs. The programs included in this table are ones for which enough hospitals provided data to make the program-specific information meaningful. In addition to the mean and median values for the data submitted, Table H-3 also includes the raw data values from all of the reporting hospitals. The raw data is included to provide a better indication of how the individual hospital data was clustered. It provides essentially the same information as a standard deviation but may be more informative for some readers.

In some cases, there is a pronounced clustering of the raw data with very few outliers. This pattern suggests that there is considerable consistency between hospitals with respect to these programs, and that the outliers may represent data reporting errors or inconsistencies on the part of a few hospitals. Examples of this relatively “tight” data include the drug costs per patient day for long term care and mental health, as well as the staffing information for the mental health and investigational drug programs.

For other programs the raw data is scattered over a fairly broad range, without much clustering around the mean. The wide variations in paid hours per patient day for programs like critical care may suggest that there are major differences in the way that these programs are being serviced by pharmacy at different hospitals. For example several of the hospitals operate satellite pharmacy services in critical care that are associated with a very high paid hour per patient day staffing indicator. In contrast other hospitals provide very minimal service to their critical care areas. The variability in pharmacy services to these programs may indicate the need for the profession and the affected clinical programs to establish standards for the pharmacy services delivered to these patient groups.

Wide variations in the drug cost per patient day for some of these specialized programs may also indicate differences in the type of drug therapy being used at different facilities, which would again be a standard of care issue. However it is also possible that the wide variations represent

an inconsistency in what is being included in the drug costs for any given program. For example some hospitals start thrombolytics in the emergency room and charge those costs to that area. Other facilities charge those same costs to the critical care areas

The paid hours per concurrent investigational drug study managed was quite consistent between facilities. The mean of approximately 50 hours per study suggests that the human resource costs of managing these studies are substantial. Given that the mean number of concurrent studies was over 100, the average hospital providing this service would be committing approximately 2.5 FTEs to investigational drug study management.

For oncology admixture preparation, the paid hours per admixture cover a fairly broad range, but there is a reasonably close clustering around the mean value of 0.51. This suggests that this figure would be a reasonable benchmark value and that it should be useful for program planning purposes.

It was of interest that the number of facilities that identified staffing resources committed specifically to dialysis increased from 6 to 14. Although there was no useful denominator that would allow a calculated staffing indicator such as paid hours per dialysis patient, the number of FTEs committed to the dialysis program ranged from 0.2 to 5. These were virtually all pharmacists, indicating that the services offered were primarily clinical in nature.

Conclusion

The data provided in the program-based benchmarking survey for 2001/2002 validates the methodology that was used in the two previous benchmarking surveys. The results demonstrate that increases in both staffing and drug costs have occurred over the two year period. Drug cost increases in this program-based analysis appear to be occurring in many different program areas. Staffing for pediatric pharmacy services approaches twice the amount required for adult services. A number of program-specific pharmacy indicators for both staffing and drug costs have been derived from the survey results. Some of these appear to be quite reliable benchmark indicators while others must be interpreted more cautiously. The variability in pharmacy staffing for some specialized programs speaks to the need for the development of standards for the pharmacy services delivered to those programs. If this survey is to be repeated on a regular basis, it would be desirable to better define the data that should be collected and reported for each program area. It is anticipated that this would improve the reliability of the data being collected and thus would result in better benchmark indicators.

Table H-1 – 2001/2002 Human Resource and Drug Cost Data for 24 Adult Hospitals Before and After Adjustment for Specialized Inpatient and Outpatient Pharmacy Programs

	All Hospitals Combined			Hospitals with 300 to 500 Beds			Hospitals with More Than 500 Beds		
	All (n=22)	≥ 90% UD/CIV A (n=6)	Traditional/ Mixed (n=16)	All (n=11)	≥ 90% UD/CIVA (n=3)	Traditional/ Mixed (n=8)	All (n=11)	≥ 90% UD/CIV A (n=3)	Traditional/ Mixed (n=8)
Pharmacy Paid Hours per Patient Day									
1. Before Adjustment									
Mean	**0.68**	**0.78**	**0.55**	**0.64**	**0.70**	**0.57**	**0.71**	**0.82**	**0.54**
Minimum	0.24	0.46	0.24	0.46	0.56	0.46	0.24	0.46	0.24
Maximum	1.31	1.31	0.74	0.83	0.83	0.73	1.31	1.31	0.74
2. After Adjustment									
Mean	**0.64**	**0.72**	**0.55**	**0.61**	**0.69**	**0.54**	**0.66**	**0.74**	**0.56**
Minimum	0.44	0.51	0.44	0.45	0.53	0.45	0.44	0.51	0.44
Maximum	0.96	0.96	0.64	0.84	0.84	0.63	0.96	0.96	0.64
Drug Costs per Patient Day									
1. Before Adjustment									
Mean	**65.52**	**71.79**	**57.38**	**42.66**	**40.32**	**44.96**	**77.72**	**85.77**	**65.64**
Minimum	15.25	26.68	15.25	26.68	26.68	34.98	15.25	41.78	15.25
Maximum	154.65	154.65	154.27	63.32	63.32	58.23	154.65	154.65	154.27
2. After Adjustment									
Mean	**31.82**	**31.90**	**31.71**	**28.28**	**24.45**	**32.11**	**34.38**	**35.99**	**31.17**
Minimum	14.75	14.75	19.81	14.75	14.75	26.07	16.94	16.94	19.81
Maximum	54.38	49.08	44.26	39.92	38.56	39.92	49.08	49.08	44.26

Table H-2– 2001/2002 Human Resource and Drug Cost Data for 4 Pediatric Hospitals Before and After Adjustment for Specialty Inpatient and Outpatient Programs

	All Pediatric Hospitals (n=4)	≥ 90% UD/CIVA (n=3)	Traditional/ Mixed Systems (n=1)
Pharmacy Paid Hours per Patient Day			
1. Before Adjustment			
Mean	1.58	1.71	1.16
Minimum	0.95	0.95	1.16
Maximum	2.45	2.45	1.16
2. After Adjustment			
Mean	1.60	1.93	1.24
Minimum	1.06	1.06	1.24
Maximum	2.50	2.50	1.24
Drug Costs per Patient Day			
1. Before Adjustment			
Mean	81.94	87.87	64.17
Minimum	23.86	23.86	64.17
Maximum	162.15	162.15	64.17
2. After Adjustment			
Mean	58.61	61.13	52.22
Minimum	25.51	25.51	52.22
Maximum	98.10	98.10	52.22

Table H-3 - Pharmacy Programs: 2001/2002 Human Resource and Drug Expenditure Data from 24 Adult Hospitals with More Than 300 Beds

	Adult Critical Care		Long Term Care		Mental Health		Oncology Admixture		Investigational Drugs	General (Med/Surg) Inpatient Beds	
	Paid Hours/ Pt. Day	Drug Cost/ Pt Day	Paid Hours/ Pt Day	Drug Cost/ Pt Day	Paid Hours/ Pt. Day	Drug Cost/ Pt. Day	Paid Hours/ Admix	Drug Cost/ Admix	Paid Hours/ Study Managed	Paid Hours/ Pt. Day	Drug Cost/ Pt. Day
Number of Observations	14	18	10	11	13	16	15	12	11	22	17
Mean Value	1.0	123.90	0.13	5.86	0.31	9.31	0.51	158.24	52.74	0.64	31.50
Median Value	0.72	118.52	0.11	6.09	0.29	9.12	0.50	133.93	45.0	0.61	29.45
Individual Data Points from the Reporting Facilities	0.25 0.30 0.49 0.61 0.64 0.68 0.68 0.75 0.77 0.81 0.88 1.14 2.41 3.60	46.39 58.31 61.65 88.97 91.66 94.43 99.81 105.03 117.31 119.72 120.26 129.36 132.54 133.64 155.39 211.87 226.29	0.02 0.05 0.06 0.09 0.09 0.13 0.16 0.16 0.17 0.37	2.67 4.09 4.40 4.78 4.93 6.09 6.42 6.72 7.00 7.89 9.45	0.22 0.24 0.24 0.26 0.26 0.28 0.29 0.29 0.34 0.36 0.36 0.40 0.48	5.02 5.61 6.69 6.84 7.46 8.43 8.61 8.77 9.47 9.81 10.12 10.61 10.87 12.56 13.24 14.89	0.21 0.24 0.31 0.32 0.35 0.43 0.48 0.50 0.58 0.59 0.62 0.63 0.70 0.77 0.79	90.62 96.42 101.15 111.67 124.71 133.06 134.79 158.64 192.59 212.81 259.33 283.11	19.5 37.0 39.0 42.2 44.3 45.0 47.8 57.4 58.5 67.4 122.0	0.44 0.45 0.50 0.51 0.51 0.53 0.53 0.57 0.58 0.59 0.60 0.61 0.61 0.63 0.64 0.74 0.75 0.77 0.84 0.85 0.89 0.96	14.75 16.94 17.62 19.81 21.17 26.07 26.85 27.49 29.45 34.98 37.91 38.56 39.92 44.26 44.91 45.86 49.03

Pediatric Hospitals

Jean-François Bussières

A separate analysis of data from pediatric hospitals was conducted for the 2001/2002 report, since this group is generally known to have differences in drug costs, staffing and drug distribution. Table I-1 provides a selection of key indicators comparing data provided by respondents from pediatric facilities (n=7) to data submitted by all respondents (n=123). The pediatric facilities identified for this analysis had all responded to the main survey as distinct stand-alone operations.

The average of reported number of beds in 2001/2002 is only slightly lower in pediatric hospitals than in the overall group, but a difference is more evident for acute care length of stay (an average of 5.6 days in pediatric vs. 7.1 days overall). The shorter acute care length of stay is reflected in a higher drug cost/patient day in pediatric facilities ($48 vs. $31) whereas the drug costs/acute care admission are similar for both clienteles (~$220/admission). The situation is different for non acute drug costs, where interestingly, although the average of non acute drug costs per non acute inpatient day was lower for pediatric facilities than for the all respondent group, the non acute drug costs per non acute admission were higher in the pediatric group. The proportion of drug expenses by patient care area are larger in ambulatory (take home) patients in pediatric (23.8%) than in the all-respondent group (8.4%). This may be related to expensive orphan drug programs available for a small cohort of patients in pediatrics.

Respondents from pediatric hospitals reported a larger staffing on average. This is probably due to factors such as longer pharmacy opening hours (105 hours/week on average in pediatric vs 82 in the all respondent group), larger IV admixture production (1.84 admixture/acute patient days in pediatric vs 1.19 overall) and a larger proportion of unit dose systems (55% in pediatric vs 45% overall). These services create a more intensive pharmacy workload to the benefit of nursing. The difference in staffing for pediatrics versus adults may also be partially explained by the need to individualize doses based on weight/body surface area, which requires both more preparation time for drug distribution and more time spent verifying the physician's order by clinical pharmacists.

Finally, the potential for clinical pharmacy interventions is greater or equal in pediatric populations than in adult hospitals. Although the average of reported number of interventions per pharmacist was lower in the pediatric group than in the overall group (446 vs. 568), the average of reported number of interventions per admission was higher (0.7 vs. 0.6).

A selection of respondents was approached to complete a distinct section on benchmarking, and four pediatric hospitals also completed that questionnaire. Three of these four sites are represented in the group of seven pediatric facilities discussed above; the fourth was a pediatric facility operating within a larger pharmacy department in a multi-site complex. For additional information and discussion of the benchmarking results for pediatric facilities, please refer to the section entitled "A Program Breakdown of Benchmark Indicators for Pharmacy Staffing and Drug Costs."

Table I-1– Comparison of Key Indicators for Pediatric and All Respondents

Key indicators	All respondents, (n = 123) [1]	Pediatric hospitals only (n = 7)
Demographics		
Number of beds – acute care	312 ± 243	268 ± 135
Average length of stay – acute care	7.1 ± 1.8	5.6 ± 1.1
Number of beds- non acute care	141 ± 224	114 ±112
Average length of stay – non acute care	194 ± 230	256 ± 357
Number of beds – total	418 ± 333	301 ± 170
Staffing and compensation		
Total approved FTE	39.1 ± 37.8	47.2 ±24.8
Proportion of time spent by pharmacists in		
- drug distribution	46%	52.2 %
- clinical activities	39 %	33.9 %
- teaching	6%	4.1 %
- pharmacy research	2%	1.8 %
- other	7 %	8.1 %
Paid hours/acute patient day (excluding residents)	0.7 ± 0.3	1.5 ± 0.5
Salary costs/acute patient days	19.2 ± 9.9	36.4 ± 15.7
Salary costs/FTE (without residents)	49 298 ± 9518	46 776 ±8230
Drug purchasing & inventory		
Percentage of drug expenses by patient care area		
- inpatient acute care		
- clinical/medical day unit	58.7	53.8
- emergency room	21.2	20.2
- ambulatory (take home)	8.4	1.6
- inpatient long-term care	6.4	23.8
	5.2	0.5
Acute care inpatient drug costs/acute patient day	31 ± 17.3	48.2 ±16
Drug costs/acute admission	222 ±142	221 ±74
Non acute care inpatient drug costs/non acute patient day	6.6 ±4.7	3.6 ± 0.7
Drug costs / non acute admission	1445 ±1449	2171 ± 2854
Clinic medical day unit costs/ clinic. day unit visit	9.9 ± 8.8	6.2 ± 9.2
Emergency room costs/emergency visit	6.5 ±3	1.5 ± 0.5
Total drug costs/total patient days	25.9 ±17	41.9 ± 15.7
Value of drug inventory at year end	631 105 ±639 411	567243 ± 257851
Drug distribution		
Pharmacy opening hours per week	82 ± 25	105 ±32
Pharmacy space available – total	6987 ± 2463	5698 ± 4021
Proportion of beds serviced by		
- unit dose system	40 %	43 %
- unit based-automated disp. system	5 %	12 %
- traditional system	40 %	32 %
- total wardstock system	2 %	3 %
- controlled card system	13 %	10 %
# IV admixture production/acute patient day (=90 %)	1.19 ± 0.99	1.84 ± 0.38
Clinical pharmacy services		
# of Interventions/admission	0.6 ± 0.6	0.7 ±0.6
# of interventions per pharmacist	568 ± 571	446 ± 380

[1] Including pediatric hospitals

2002 RESPONDENTS

Respondents from hospitals included in the following list completed a major part of the survey. We recognize their effort to complete the Hospital Pharmacy in Canada Survey of 2001/2002.

Please note that not all of the listed respondents were included in the data analysis. Only responses completed before July 21, 2002, from hospitals with a minimum size of 100 total beds (and 50 acute care beds) were included.

Hospitals <201 Beds

Cranbrook Regional
Dawson Creek Hospital
G.F. Strong Rehabilitation Ctr - Coastal Region
Hôtel-Dieu de Montmagny
Riverview
C.H. regional de Sept-iles
C.H. St-Joseph de La Malbaie
Stanton Regional Hospital
Yorkton Regional Health Centre
Rouge Valley Health System, Ajax and Pickering Health Centre
C.H. régional Baie-Comeau
Brockville General Hospital
C.H. CHSLN de Papineau
Alberta Children's Hospital *
Hôtel Dieu Hospital
Dartmouth General Hospital *
DELTA
Hôpital Ste Croix
Northern Lights Regonal Health Center
Guelph General Hospital
Lake of the Woods District Hospital
St. Mary's General Hospital
Miramichi Regional Health Authority
C.H. Fleury
Hôpital de Montréal pour enfants *
Institut de Cardiologie de Montréal *
Moose Jaw Union
Aberdeen Hospital
Orillia Soldiers' Memorial Hospital
Children's Hospital of Eastern Ontario *
Pembroke General Hospital
Hôtel Dieu Health Sciences Hospital
C.H. Beauce Etchemin
Stratford General Hospital
Prince County Hospital
Hôtel-Dieu d'Arthabaska *
Concordia Hospital
Woodstock General Hospital

Hospitals 201-500 Beds

MSA General Hospital
Centre Le Jeannois
Brandon Regional Health Centre
Peninsulas Health Care Corp.
Joseph Brant Memorial Hospital
Cambridge Memorial Hospital
Queen Elizabeth Hospital *
Complexe hospitalier de la Sagamie *
Chilliwack General Hospital
ST. Joseph's General Hospital
C.H. CR Antoine-Labelle
Capital Health, Grey Nuns Community Hospital *
Capital Health, Misericordia Community Hospital *
C.H. de Granby
Queen Elizabeth II
IWK Health Centre *
St Joseph's Healthcare *
Carrefour de sante de jonquiere
Royal Inland Hospital
Kingston General Hospital *
C.H. de Lachine
Cité de la Santé de Laval *
Chinook Health Region
Hôtel-Dieu de Lévis *
C.H. Pierre Boucher
Markham Stoufville Hospital
Medicine Hat Regional Hospital
The Credit Valley Hospital
Régie régionale de la santé Beauséjour *
The Moncton Hospital *
C.H. de St. Mary's
Hôpital général de Montréal *
Sainte-Justine *
Nanaimo Regional General Hospital
Royal Columbian *
Southlake Regional Health Centre
Battlefords Union Hospital
Halton Healthcare Services
Peterborough Regional Health Centre
C.H. universitaire de Québec, C.H. de l'Université Laval *
C.H. universitaire de Québec, Hôpital Saint-François d'Assise *
C.H. universitaire de Québec, L'Hôtel-Dieu de Québec *
C.H. AQ-Pavillon Enfant Jésus, St. Sacrement *
Red Deer Regional Hospital
York Central Hospital
C.H. de Riviere-du-Loup
Hôtel-Dieu de Roberval
Atlantic Health Sciences Corporation *
Lambton Hospitals Group
Sault Area Hospitals
Rouge Valley Health System, Centenary Health Centre Site
The Scarborough Hospital General Div
The Scarborough Hospital Grace division
C.H. Centre-de-la-Mauricie

Thunder Bay Regional Hospital
The Hospital for Sick Children *
Toronto East General Hospital
C.H. régional du Suroit
St.Paul's Hospital *
Vancouver Hospital *
C.H. de Verdun *
Vernon Jubilee Hospital
Wetaskiwin Hospital and Health Centre
Hôtel Dieu Grace Hospital
Grace General Hospital
Seven Oaks General Hospital *
Holy Family Hospital
Mount Sinai *
Centre hospitalier régional de Trois-Rivières
C.H. regional de Sept-iles

Hospitals >500 Beds

William Osler Health Centre
Calgary Health Region *
Capital Health, Royal Alexandra Hospital *
Capital Health, University of Alberta Hospital *
C.H. universitaire de Sherbrooke *
River Valley Health *
Queen Elizabeth II Health Sciences Centre *
London Health Sciences Centre *
St. Joseph's Health Care, London *
Hôpital Maisonneuve-Rosemont *
Jewish General Hospital *
C.H. de l'université de Montréal (CHUM) *
Hôpital Royal Victoria *
The Ottawa Hospital *
Regina Health District *
Saskatoon District Health *
Health Care Corporation of St. Johns *
C. H. régional de Lanaudière
Hôpital du Haut-Richelieu
Surrey Memorial Hospital
Humber River Regional Hospital
St. Michael's Hospital *
University Health Network *
Children's, Women's and SunnyHill Hospitals *
Vancouver General Hospital *
Royal Jubilee Hospital
Health Sciences Centre *
St. Boniface General *
Riverview *

**Teaching Hospital*

Worksheet 2001/2002

Key Indicators	All Hospitals	Teaching Status		Bed Size		
		No	Yes	100- 200	201- 500	>500
1. Acute Inpatient Drug Costs / Acute Admission	$ 221.90 (71)	$ 140.11 (38)	$ 316.07 (33)	$ 171.50 (17)	$ 195.00 (35)	$ 316.53 (19)
2. Nonacute Inpatient Drug Costs / Nonacute Admission	$ 1,449 (43)	$ 1,386 (31)	$ 1,611 (12)	$ 972 (7)	$ 1,746 (25)	$ 1,078 (11)
3. Inventory Turnover Rate	9.59 (111)	8.57 (65)	11.03 (46)	8.28 (28)	9.40 (56)	11.33 (27)
4. IV Production / Acute Patient Day for 3 90% Patients	1.19 (55)	1.00 (24)	1.33 (31)	1.16 (10)	1.15 (31)	1.27 (14)
5. Number of Interventions / Admission	0.60 (57)	0.60 (30)	0.60 (27)	0.61 (12)	0.62 (31)	0.55 (14)
6. Paid Hours / Acute Patient Day	0.75 (116)	0.62 (66)	0.92 (50)	0.64 (29)	0.72 (61)	0.92 (26)

	>= 90% Unit Dose	>= 90% Tradi tional	>= 90% CIVA	>= 90% CIVA & UD	>= 90% CIVA & Trad
6. Paid Hours / Acute Patient Day	0.90 (27)	0.64 (30)	0.86 (59)	0.93 (20)	0.75 (11)

1. Acute Inpatient Drug Costs / Admissions (Acute Care)
2. Nonacute Inpatient Drug Costs / Admissions (Nonacute Care)
3. Inventory Turnover Rate
4. Total IV Admixture Product / Acute Care Patient Days for >= 90% CIVA
5 Pharmacokinetic or therapeutic interventions / Admissions
6. Total # of Approved FTE (Excluding Residents) x 1950 hours / Acute Care Patient Days

Base: All respondents answering questions used in formula ( )