Clinical Pharmacist Staffing Levels Needed to Deliver Clinical Services in Australian Hospitals

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ABSTRACT

Background: The Society of Hospital Pharmacists of Australia's (SHPA) Standards of practice for clinical pharmacy list 10 activities pharmacists undertake to provide a comprehensive clinical service to inpatients and the staffing level needed to deliver this service (based on bed type). Time motion data from a recent Australian study could be used to elucidate the number of beds for which a pharmacist can provide clinical services (based on time taken for individual clinical activities).

Aim: To calculate the number of patients/inpatient beds for which a pharmacist can provide clinical services.

Method: A profile of clinical pharmacy activities and how often they need to be delivered to meet the SHPA Standards was developed for different patient types. Formulae were developed and populated with the time motion data to calculate clinical pharmacist staffing levels.

Results: Staffing levels for 7 categories of patients/inpatient beds were elucidated. These calculations suggest the clinical pharmacist to bed type ratios described in the SHPA Standards considerably underestimate the time required to deliver a comprehensive clinical pharmacy service.

Conclusion: Times per activity used in this exercise are conservative and provide the maximum number of patients for which a pharmacist can provide clinical services. These staffing levels could be used to allocate resources to achieve agreed clinical pharmacy service delivery in Australian hospitals.

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BACKGROUND

The Society of Hospital Pharmacists of Australia's (SHPA) Standards of practice for clinical pharmacy list ten activities pharmacists undertake to provide a comprehensive clinical service to inpatients.[1] The SHPA Standards also document the staffing needed to deliver a clinical pharmacy service based on bed type.[1]

The number of hospital inpatients is determined by the number of beds, length of stay and occupancy rate over a given time period. The number of beds, rather than the number of patients, has been used as a workload measure for pharmacy services in Australian hospitals as the unit of 'one bed' is easily understood by hospital managers. Recommendations for clinical pharmacist to bed type ratios were first described in the 1996 SHPA Standards of practice for clinical pharmacy. The ratios published in the revised 2005 SHPA Standards (Table 1) assume a clinical pharmacy service offered during normal business hours.[1]

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Table 1. Clinical pharmacist to bed type ratios recommended in the SHPA Standards[1]

Type of bed	Beds:pharmacist
Hospice, long-term psychiatry, nursing home	90:1
Radiation oncology	75:1
Day surgery, obstetric, plastic surgery, rehabilitation	50:1
Surgical including cardiothoracic, gastroenterology, gynaecology, neurosurgery, orthopaedics and vascular	40:1
Medical including acute psychiatry, burns, cardiovascular, dermatology, endocrinology, gastroenterology, general paediatric,* infectious disease, neurology, ophthalmology, palliative care, respiratory and vascular	30:1
Specialist units including HIV, neonatal, nephrology, oncology (including same day services) and transplants	20:1
Critical care units and haematology/bone marrow transplant services	15:1

*For paediatric speciality beds use ratio for the designated speciality.

A doctoral thesis exploring clinical pharmacy input for inpatients according to disease, compiled and analysed time motion data on a range of clinical pharmacy activities.[2,3] This article seeks to marry these time motion data with the clinical pharmacy services described in the SHPA Standards and calculate the number of patients/inpatient beds for which a pharmacist can provide clinical services.

METHOD

Time motion data from Stuchbery's[2] doctoral thesis were used to calculate the mean times required for a range of clinical pharmacy activities (Table 2). The SHPA Standards were used to compile a profile of clinical pharmacy activities and how often they need to be delivered to meet the SHPA Standards for different patient types (Table 3).[1]

Assumptions

The following general assumptions were made for a five day period:

- unless data were available, an average length of stay of 6 days (length of stay for overnight admissions in Australia's public hospitals in 2008/09);[4]
- bed occupancy rate of 95%;
- clinical pharmacists work 38 hours during week days (excludes time for meal breaks) and have minimal distribution or management responsibilities/ workload;
- five hours for attending ward/clinical unit rounds;
- three and a half hours travel time within the hospital;
- three and a half hours for pharmacy staff meetings/ liaison with other pharmacy staff; and
- maximum of two hours 'unproductive' time per week.

Table 2. Time needed by clinical pharmacists to undertake clinical activities for medical and surgical patients[2]

Clinical pharmacy activities	Medical patients		Surgical patients	
	Mean time (+SD) (min)	Mean frequency of delivery	Mean time (+SD) (min)	Mean frequency of delivery
Medication history interview with medication reconciliation	10.2 (5.8-14.6)	0.7	8.3 (3.8-12.8)	0.6
Interventions	6.3 (3.0-9.6)	0.4	4.9 (2.8-7.0)	0.4
Medication order review	3.6 (2.3-4.9)	1.9	3.2 (2.0-4.4)	2.5
Clinical review	6 (3.1-8.9)	0.9	4.5 (2.4-6.6)	0.8
Therapeutic drug monitoring	3 (1.7-4.3)	0.1	2.7 (1.8-3.6)	0.2
Provision of drug information to patient	3.8 (1.7-5.9)	0.2	3.6 (2.0-5.2)	0.3
Adverse drug reactions	5.5	0.008	5.5	0.005

The following specific assumptions were made:

- twice-daily medication order and clinical reviews for specialist and critical care patients;
- length of stay in intensive care units approximates 3.6 days and the mortality rate in intensive care has been estimated at 16%.[5,6] Therefore, assuming 100% occupancy the number of inpatients over seven days for every 20 intensive care beds used was 39 and clinical pharmacy services on transfer from intensive care were not included for 16% of patients. Time required for provision of drug information on transfer was not included and the time for attending ward/clinical unit rounds was increased to eight hours;
- time required for therapeutic drug monitoring, adverse drug reaction management/interventions and attending ward/clinical unit rounds were not included for patients with minimal medicines;
- length of stay of 21 days recorded for rehabilitation separations was used for long-stay patients.[4] Time required for therapeutic drug monitoring, adverse drug reaction management/interventions were removed and the time for attending ward/clinical unit rounds was reduced to one and a half hours; and
- no time was allowed for ward/clinical unit rounds for same-day patients.

The Australian Institute of Health and Welfare publishes aggregated data on hospital services, such as information on patient episodes by service-related groups (categories based on clinical divisions, e.g. haematology). These service-related groups were used to categorise patients and bed types.[4]

RESULTS AND DISCUSSION

Formulae were generated to estimate the requirements for clinical pharmacy time in order to recommend clinical pharmacy staffing levels. The populated formulae using the time motion data and total clinical pharmacy times calculated for patient types are shown in Table 3. The recommended clinical pharmacist staffing levels for provision of clinical pharmacy services are summarised in Table 4.

Table 3. Calculation of clinical pharmacist staffing levels needed for different patient types

Assumptions	General medical	General surgical	Specialist unit	Critical care	Minimal medicine use	Long-stay	Same-day
Ave. LOS (days)	6	6	6	3.6	6	21	1
Occupancy rate	95%	95%	95%	100%	95%	95%	-
Pharmacist time for direct patient care	1440 min	1440 min	1440 min	1260 min	1740 min	1650 min	1740 min
Services on transfer to area	(1xMHR)+(1xMOR)			(1xMOR) (21 patients/wk)	(1xMHR)+(1xMOR)	(9 patients/wk)	-
Services during admission	[(LOS-2)x(MOR+CR)]+[PDI+(RxTDM)+(RxADR)+(RxINT)]			[(LOS-2)x(2xMOR +2xCR)]+[(RxPDI)+(RxTDM)+(RxADR) +(Rx INT)]	[(LOS-2)x (MOR+CR)] +(RxPDI)	[(LOS-2)x(MOR +CR)]+PDI (132 patients/wk)	-
Services on transfer out of area	MOR+CR+2xPDI (15 patients)					(9 patients/wk)	(110 patients/wk)
Estimated minutes/ patient (min-max)	76 (40-106)	63 (34-88)	115 (62-161)	1105 (583-1469) (21 patients)	58 (32-83)	1580 (880-2581) (39 patients)	1720 (880-2560) (110 patients)
Estimated no. of patients/wk (min-max)	19 (14-36)	23 (16-43)	13 (9-23)	21 (15 T, 6 D) 17 (12, 5)-42 (30, 12)	30 (21-55)	39 (18 T) 30 (16, 14)-82 (44, 38)	110 (75-217)
Estimated no. of beds covered/wk (min-max)	17 (12-32)	21 (15-38)	12 (8-21)	10 (8-20)	27 (19-49)	30 (21-58)	-

ADR = adverse drug reactions. CR = clinical review. D = deaths. INT = interventions. LOS = length of stay. MHR = medication history interview with medication reconciliation. MOR = medication order review. PDI = provision of drug information to patient. R = rate. T = transfers. TDM = therapeutic drug monitoring.

Table 4. Proposed clinical pharmacist staffing levels for provision of clinical pharmacy services for a five day period

Category*	Service-related group/bed type	No. of patients to pharmacist	No. of beds to pharmacist
1 (critical care, high dependence on medicines)	Critical care, extensive burns, tracheostomy and ECMO	21	10
2 (specialist unit, high dependence on medicines)	Haematology, immunology and infections, medical oncology, renal medicine, transplantation, qualified neonates	13	12
3 (medical)	General medical, cardiology, interventional cardiology, dermatology, endocrinology, gastroenterology, chemotherapy, neurology, respiratory medicine, rheumatology, pain management, definitive paediatric medicine, acute psychiatry, palliative care, acute definitive geriatrics	19	17
4 (surgical)	General surgical, breast surgery, cardiothoracic surgery, colorectal surgery, upper gastrointestinal surgery, head and neck surgery, neurosurgery, orthopaedics, plastic and reconstructive surgery, urology, vascular surgery	23	21
5 (minimal change to medicines)	Ear nose and throat, gynaecology, obstetrics, unqualified neonates, perinatology	30	27
6 (day surgery)	Day surgery beds, diagnostic gastrointestinal endoscopy, renal dialysis, dentistry, ophthalmology	110	110 patients per week
7 (long-stay)	Rehabilitation, drug and alcohol, non-acute geriatric	39	30

*For paediatric specialty beds use ratio for the designated speciality.

Data Limitations

Generalisations

A limitation of this exercise is the generalisation of parameters, e.g. using average length of stay for 'rehabilitation' patients to calculate the staffing level required for 'longer medical admissions'. This approach was adopted as there are no specific/national data on admission subtypes. Australian casemix studies have highlighted the need to consider similar patient groups in 'bands' of resource use.[6] Although the details of each subgroup may differ, the overall resource use is similar.

The time motion data reflect clinical pharmacy services at two Melbourne metropolitan teaching hospitals in 2006.[2] Data were collected on 4625 inpatient episodes and the 20 500 clinical pharmacy services provided to these patients, making it the largest study of its type in Australia.[2] Clinical pharmacist staffing at the two hospital was below the recommendations in the 2005 SHPA Standards and would have impacted on the time available for the delivery of clinical pharmacy activities and the times recorded for these activities may be low. The time for a clinical pharmacist intervention in the 2003 clinical pharmacy intervention study was 9.6 minutes per intervention.[7] The mean times used in this exercise were 6.3 minutes per intervention for medical patients and 4.9 minutes per intervention for surgical patients. Bond et al.[8] estimated times for adverse drug reaction monitoring of 14 minutes (mean time used in this exercise 5.5 minutes) and admission drug histories of 17 minutes (mean times used in this exercise 8.3 to 10 minutes). Another US study found that the time for admission interview, assessment on admission and follow-up of discrepancies was 24 minutes.[9] None of these studies distinguished between patient types.

Although there are limited comparative data, the mean times per activity used in this exercise are conservative and identify the maximum number of patients/beds for which a pharmacist can provide clinical services, rather than a minimum figure.

There is an inherent error is extrapolating the times and rates of delivery recorded for general medical and surgical patients to complex patients, as it underestimates the time per patient required. In the absence of data specific to complex patients, these general times and rates of delivery were used.

Choice of Unit of Measure

Stuchbery[2] also analysed patients using the casemix system of diagnosis-related groups. A diagnosis-related group can only be allocated on completion of an admission and there is often variance between the reason for admission and the ultimate reason for, and classification of, the admission. For example, an admission for collapse or loss of consciousness may result in a medical admission with the introduction of a new medicine or cardiac surgery.

Australian casemix studies have shown that a considerable number of diagnosis-related groups are not resource homogenous from a pharmacy perspective.[6] To be useful to hospital and pharmacy managers, the unit of measure must be resource homogenous and meaningful to all stakeholders. The number of patients or the number of beds by patient type have therefore been used as the unit of measure.

Formulae

The clinical pharmacy services described in the SHPA Standards were used to build the formulae as they are the only published comprehensive description of clinical pharmacy activities. Other Australian publications describe hospital-wide services required for the safe and effective use of medicines.[10-12]

Where an activity is provided at a point of transfer within the hospital, the time for the activity was assigned at the time of transfer into the patient care area. This ensured the activity was not included twice. When considering the staffing levels proposed, allowances should be made for different service delivery models. For example, an activity such as medication history on admission when undertaken by the clinical pharmacist in the emergency department would reduce the workload of the pharmacist on the ward.

Frequency of clinical activities, such as therapeutic drug monitoring and interventions, for general medical and surgical patients has been used in all of the calculations. (This underestimates services for complex patients, e.g. those in critical care beds.) As patients with minimal medicines are less likely to require specialised services, such as therapeutic drug monitoring, these clinical activities were not included in the calculations.

Clinical Pharmacist Staffing Levels

Data on the workload manageable by one pharmacist allows hospital managers to allocate resources to achieve agreed levels of service delivery. Using data from over 33 million admissions, Bond et al.[8] have shown that an increase in the number of clinical pharmacists to occupied beds is positively associated with decreases in medication errors, patient morbidity and mortality, length of stay, drug costs and total costs of care.

An Australian study estimated that at least 40% of acute public sector beds would be classified as 'general medical' according to the SHPA Standards.[13] This makes the staffing level required for clinical pharmacy services for general medical patients a crucial figure for planning clinical pharmacy services.

Although the number of patients in specialist bed types is less significant, there is a heavy reliance on medicines, and an increased inherent risk to patients. These patients require a more intensive clinical pharmacy service (reflected in the SHPA Standards and in the results of this study).

There are gaps in the staffing levels proposed for some patient groups where clinical pharmacists' roles are expanding. Clinical pharmacists are well established, in emergency departments but the variation in the complexity of patients treated in emergency departments and lack of casemix data makes it impractical to consider all emergency departments as a homogeneous category. The authors recommend that the proposed clinical pharmacy staffing level for the medical patient category would be appropriate for emergency department services. Similarly, the proposed clinical pharmacy staffing level for same-day patients would be appropriate for non-inpatients, such as patients seen in outpatient clinics.

The staffing levels proposed are based on an average length of stay of six days. In hospitals or patients with a low average length of stay, and therefore high throughput, the number of beds able to be covered by a pharmacist would be lower. For example, in a hospital with an 'acute medical unit' (length of stay two to three days) the staffing level required for 20 patients would be higher than for 20 patients in the general medical unit.

Changes to Clinical Pharmacist Staffing Levels

The SHPA Standards state that extended services (e.g. seven day a week service, public holidays) would require more resources and there is no specific time allocation for distribution services or management activities (time has been allocated for liaison with other pharmacy staff re prescriptions). If these services are included in a pharmacist's job description, the number of patients/beds they could cover would be reduced.

In 1982, the average number of beds covered by one full-time clinical pharmacist in Victoria was 50 to 100.[14] In 1984, a study in Western Australia estimated that one full-time clinical pharmacist covered 100 beds.[15] A 2005 Australian workforce study reported that across the 88 hospitals surveyed, one full-time pharmacist covered 69 beds.[13] Only 16 of the 88 respondent hospitals offered a comprehensive clinical pharmacy service to all patients and nine offered no clinical pharmacy services. It was not surprising that the authors found that many more pharmacists were required to provide a comprehensive clinical service for the 22 824 beds at these hospitals (one clinical pharmacist to 34 beds). This highlights the difference between the number of pharmacists providing clinical services at a point in time (with differing levels of service delivery) and the number of pharmacists needed to deliver clinical pharmacy services in line with standards or guidelines.

Three major factors have driven and will continue to drive changes to the staffing levels for clinical pharmacy services, they include:

- range of services expected/required by patients, funders and boards of management;
- complexity of care (linked to patient age; number of diagnoses; and number, range and type of medicines used); and
- hospital throughput (combination of number of beds, length of stay and occupancy).

Range and Delivery of Clinical Pharmacy Services

The range of clinical pharmacy services described in the SHPA Standards has changed slightly over the past three revisions. The major change has been in the expectation of services required. Patients expect services that support their safety and the quality use of medicines. In 2004, Australian Health Ministers agreed to seven uniform steps aimed at improving safety in public hospitals in the national health reform agenda.[16] One of the steps was: 'To also help safer use of medicines, by the end of 2006, every hospital will have in place a process of pharmaceutical review of medication prescribing, dispensing, administration and documenting processes for the use of medicines'.[16]

Over the last five years there has been an expectation that minimising the risk associated with the use of medicines (clinical and financial) is part of the corporate and clinical governance of a healthcare facility.

The Australian Council on Healthcare Standards has a specific criterion on medications: Criterion 1.5.1 Medications are managed to ensure safe and effective practice.[10] The Australian Pharmaceutical Advisory Council's Guiding principles document the activities required to achieve continuity of care and they apply to all hospital admissions.[11] As noted in the Guiding principles, implementation will vary across practice settings and none of these documents are prescriptive about which health professional should undertake specific tasks.[11] Pharmacists have the skills and competency required to deliver many of the activities and pharmacists are listed as the preferred health professional for several activities.

The growth in the number of pharmacists in hospitals that have implemented the Australian Government's pharmaceutical reforms reflects a demand for pharmacists to provide either a wider range of clinical services or clinical services to more patients. A recent study of the Victorian hospital pharmacy workforce reported an additional 185 to 200 full-time equivalent pharmacists had been added to the hospital workforce from 2002 to 2009.[17]

The traditional model for delivery of clinical pharmacy services in Australia involves pharmacists providing clinical and distribution services to a designated number of beds based on a geographical (ward) area. This approach is practical and efficient as clinical and distribution services are provided to the same group of patients. The increased role of hospital pharmacy technicians in providing distribution services to patient care areas, supports a 'new' model with clinical pharmacists assigned a designated number of beds based on a medical unit model.

The staffing levels proposed in this exercise would be applicable to both service delivery models. However, there may be a need to allow for greater travel time for the medical unit model, especially if patients are being treated on other wards rather than in the parent unit.

Any future changes to the clinical pharmacy activities described in the SHPA Standards or in community expectation about the delivery of these services will impact on clinical pharmacy staffing levels.

Complexity of Care

Anecdotally, the changes in complexity of care require more clinical pharmacists' time. Measuring changes in complexity is difficult as casemix relative value units (standard measure of complexity for hospital admissions) can measure the complexity of individual admissions. However, diagnosis-related groups and the relative value unit for each diagnosis-related group are routinely redefined and reset (making comparisons over time difficult).

Data on the number of diagnoses per admission are available but they combine same-day and overnight admissions. The number of prescriptions per person per year in the community has increased over the last decade (1997: estimated 9.7 prescriptions/person/year vs 2007: estimated 12 prescriptions/person/year) but how this impacts on complexity for hospital admissions has not been defined. It is accepted that the ageing of the population contributes to complexity of care in community and hospital settings.

Another driver of complexity is the increase in the number and range of medicines available, with associated increases in drug–drug interactions and medication safety issues. Pharmacists' improved access to information in the acute setting should also be considered, i.e. almost immediate access to test results increases the range of parameters that can and need to be considered when assessing medication management.

Hospital Throughput

National data on public hospital beds and overnight admissions show that the average number of overnight admissions per licensed bed was 38.5 in 1997/98 and 44.5 in 2008/09.[3,18] Over the same time, the number of overnight admissions changed from 2 145 759 with an average length of stay 6.4 in 1997/98 to 2 420 000 with an average length of stay 6 in 2008/09.[3,18]

The staffing level required for overnight admissions has increased reflecting the increase in the number of patients admitted per bed. However, the proposed staffing levels for same-day patients equates the ratio published in the SHPA Standards.[1]

As a large amount of clinical pharmacy time relates to the admission and discharge process, the number of admissions and their throughput is a major driver for daily/weekly clinical workload. Changes in total patient numbers and throughput will continue to impact on the staffing levels required to deliver the same range of clinical pharmacy services to similar patient groups.

CONCLUSION

This mathematical exercise illustrates that the clinical pharmacist to bed type ratios described in the SHPA Standards underestimate the time required to deliver a comprehensive clinical pharmacy service. The times per activity used in this exercise are conservative and provide the maximum number of patients for which a pharmacist can provide clinical services. These staffing levels could be used to allocate resources to achieve agreed clinical pharmacy service delivery in Australian hospitals.

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References

1. SHPA Committee of Specialty Practice in Clinical Pharmacy. SHPA standards of practice for clinical pharmacy. J Pharm Pract Res 2005; 35: 122-46.
2. Stuchbery P. Clinical pharmacy input for hospital inpatients according to disease state [doctorial thesis]. Submitted to Deakin University 2009.
3. Stuchbery P, Kong DC, De Santis GN, Lo SK. Determining clinical pharmacy workload by patient disease classification in medical and surgical patients. J Pharm Pract Res 2008; 38: 126-31.
4. Australian Institute of Health and Welfare. Australian hospital statistics 2008-09. Canberra: Australian Institute of Health and Welfare; 2009. Available from <www.aihw.gov.au/publications/index.cfm/title/11173>.
5. Moran JL, Bristow P, Solomon PJ, Hart GK. Australian and New Zealand Intensive Care Society Database Management Committee. Mortality and length of stay outcomes, 1993-2003, in the binational Australian and New Zealand intensive care adult patient data base. Crit Care Med 2008; 36: 46-61.
6. Howitt K, Brooks C, Lauchlan R, Martin ED. Refinement of an Australian pharmacy casemix classification for the acute healthcare setting. Aust J Hosp Pharm 1997; 27: 302-6.
7. Dooley MJ, Allen KM, Doecke CJ, Galbraith KJ, Taylor GR, Bright J, et al. A prospective multicentre study of pharmacist initiated changes to drug therapy and patient management in acute care government funded hospitals. Br J Clin Pharmacol 2003; 57: 513-21.
8. Bond CA, Raehl CL. Clinical pharmacy services, pharmacy staffing and hospital mortality rates. Pharmacotherapy 2007; 27: 481-93.
9. Cornish PL, Knowles SR, Marchesano R, Tam V, Shadowitz S, Juurlink DN, et al. Unintended medication discrepancies at the time of hospital admissions. Arch Intern Med 2005; 165: 424-9.
10. Australian Council on Healthcare Standards. The ACHS EQuIP 4 guide: part 2 – standards. Sydney: Australian Council on Healthcare Standards; 2006.
11. Australian Pharmaceutical Advisory Council. Guiding principles to achieve continuity in medication management. Canberra: Commonwealth of Australia; 2005.
12. NSW Therapeutic Advisory Group. Indicators for quality use of medicines in Australian hospitals. Sydney: NSW Therapeutic Advisory Group; 2007.
13. O'Leary KM, Allinson YM. Pharmaceutical review: resource implications for the pharmacy component in Australian public hospitals. J Pharm Pract Res 2006; 36: 291-6.
14. Larmour I, Allinson Y, Manser A, Spalding G, Brett K, Swan S. Clinical ward pharmacy survey – Victorian hospitals 1982. Aust J Hosp Pharm 1984; 14: 65-70.
15. Jones AN, Benzie JL, Serjeant CS, Swan GT. Activities of clinical pharmacists at ward level. Aust J Hosp Pharm 1984; 14: 77-81.
16. Australian Health Minister's Conference. Joint communiqué. Health ministers agree to reform agenda. Canberra: Department of Health and Ageing; 2004. Available from <www.health.gov.au/internet/main/publishing.nsf/Content/health-mediarel-yr2004-jointcom-jc001.htm>.
17. O'Leary KM, Newman S, Yeung S, Wright S. Coordinated strategies to attract pharmacists to the public hospital sector in Victoria. J Pharm Pract Res 2009; 39: 293-7.
18. Australian Institute of Health and Welfare. Australian hospital statistics 1997-98. Canberra: Australian Institute of Health and Welfare; 1999. Available from <www.aihw.gov.au/publications/hse/ahs97-8/ahs97-8-c00.pdf>.

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