# Determining Clinical Pharmacy Workload by Patient Disease Classification in Medical and Surgical Patients

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## ABSTRACT

**Aim:** To determine the time needed to provide clinical pharmacy services to individual patient episodes for medical and surgical patients and the effect of patient presentation and complexity on the clinical pharmacy workload.

**Method:** During a 5-month period in 2006 at two general hospitals, pharmacists recorded a defined range of activities that they provided for patients, including the actual times required for these tasks. A customised database linked to the two hospitals' patient administration systems stored the data according to the specific patient episode number. The influence of patient presentation and complexity on the clinical pharmacy activities provided was also examined.

**Results:** The average time required by pharmacists to undertake a medication history interview and medication reconciliation was 9.6 (SD 4.9) minutes. Interventions required 5.7 (SD 4.6) minutes, clinical review of the medical record 5.5 (SD 4.0) minutes and medication order review 3.5 (SD 2.0) minutes. For all of these activities, the time required for medical patients was greater than for surgical patients and greater for 'complicated' patients. The average time required to perform all clinical pharmacy activities for 1071 completed patient episodes was 14.4 (SD 10.9) minutes and was greater for medical and 'complicated' patients.

**Conclusion:** The time needed to provide clinical pharmacy services was affected by whether the patients were medical or surgical. The existence of comorbidities or complications affected these times. The times required to perform clinical pharmacy activities may not be consistent with recently proposed staff ratios for the provision of a basic clinical pharmacy service.


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## INTRODUCTION

The range and prevalence of activities that comprise clinical pharmacy services in Australian hospitals has been reported previously, along with the extent to which hospitals offer these services.[1-4] However, none of these reports specify the resources consumed by pharmacy departments in providing these services. Early reports of clinical pharmacy services in Australia provided some indication of the resources needed to provide these services per occupied bed.[5,6] Subsequent studies demonstrated more detailed workload reporting, although the surveys indicated that the nature of documentation of clinical pharmacy services was not uniform.[7-9] One national survey of documentation practices showed that no pharmacy service reported on the time spent providing clinical pharmacy services to individual patient episodes.[9]

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Recording the time needed to provide clinical pharmacy services at the individual patient level would allow the effect of patient complexity on the clinical pharmacy workload to be determined. This could help with service planning, inform the PharmGroup analysis of pharmacy episodes of care, and help manage the Australian Health Ministers' requirement to provide pharmaceutical review for inpatients.[10,11]

We have previously described recording tools to measure the time required to provide components of clinical pharmacy services.[12] The tools successfully recorded the times to conduct medication reconciliation as well as other routine medication monitoring activities and pharmaceutical interventions. Through the use of these tools, the aim of this study was to determine the time needed to provide clinical pharmacy services to individual patient episodes for medical and surgical patients and the effect of patient presentation and complexity on the clinical pharmacy workload.

## METHOD

The study was conducted at two Melbourne hospitals, the 300-bed The Northern Hospital, and the 323-bed Western Hospital, over five months from May to September 2006. The Human Research and Ethics Committees of Northern Health, Melbourne Health and Deakin University gave approval for the study. Study participants were overnight patients discharged from the medical and surgical wards at The Northern Hospital and patients discharged from the general medical and surgical units at Western Hospital. The pattern of clinical pharmacist activity at the two hospitals was confirmed by direct observation, similar to that previously reported in other Australian hospitals.[13]

At The Northern Hospital the medical and surgical wards (158 beds) were serviced by 4.5 full-time equivalent pharmacists (average 35 beds/pharmacist). Pharmacists ranged in experience from newly registered to more than 20 years post-registration. At the Western Hospital the medical and surgical units (275 beds) were serviced by 7 full-time equivalent pharmacists (average 39 beds/pharmacist). Pharmacists ranged in experience from newly registered to 12 years post-registration. The participating pharmacists completed the designated workload documentation each weekday for as many patients as possible in the high turnover environments of the two hospitals. No eligible patients were excluded.

Pharmacists at both sites recorded the medication history interview and medication reconciliation on identical Pharmaceutical Clinical Pathway (PCP) forms using the tools previously described.[12] Clinical Activity Data Sheets (CADS) were used at the two hospitals to record clinical activities such as medication chart review, clinical review, adverse drug reaction management, therapeutic drug monitoring and provision of drug information. Each patient intervention was recorded in the Riskman adverse incident monitoring system.

The recording tools were used as previously, with one modification to the PCP form—the pharmacists recorded the time to complete all details on page 1 of the form in a designated section.[12] This included the time to confirm allergy status, medication history, usual medication administration

arrangements and the current location of patients' own medicines. Data recorded on page 2 of the PCP form was not used as we previously found that this information was not recorded consistently.[12] The time needed to complete the PCP form was also recorded and the completed form was filed in the medical notes. On the CADS, the pharmacists recorded the occurrence and date of when they performed each of the activities. Every one week in four, the time required to perform each activity on the CADS and the time required for each intervention entered into Riskman was recorded. Prior to each of these 'time sampling' intervals, a training session was provided to the participating pharmacists to reinforce the need to record times, as well as the methods of recording.

Completing the PCP form and recording interventions in Riskman represented routine practice at both hospitals. The extra work incurred by participating pharmacists was the use of the CADS to record the described clinical activities and to record times to perform the activities measured by the study.

At both hospitals, eligible patients were identified from a list generated by a clerk from the Health Information Services Department. The clerk retrieved PCP forms detected from patients' medical records and provided a copy to the researchers. The completed CADS were provided to the researchers by the pharmacists as each inpatient was discharged from hospital. Finally, the researchers extracted records of pharmacists' interventions from Riskman. For each type of record, patients were identifiable only by their medical record number.

A customised database was developed to record each activity undertaken on behalf of each patient. Specifically developed software, integrated with the customised database, allowed interrogation of each hospital's patient administration system and resulted in identification of the unique patient episode number associated with each patient's admission. A clerk entered all patient data into the database, attributing all clinical pharmacy activity data associated with each patient's episode to that specific episode number (Figure 1). The process allowed the entry to the database of different patient records at different times, as these records became available. The link to each patient administration system also enabled the extraction of patient data relating to that episode, such as length of stay and the patient's assigned diagnosis-related group classification (Figure 2).

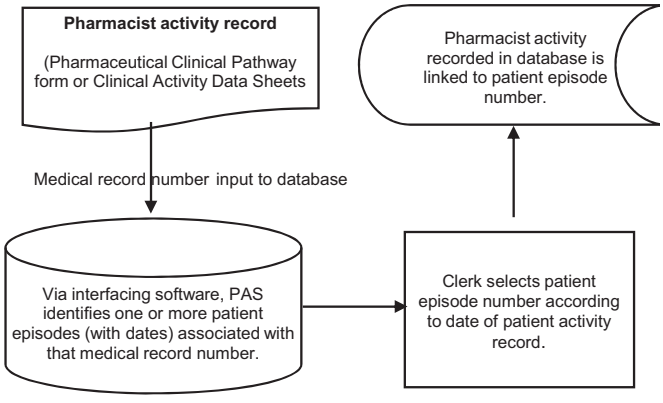


**Figure 1. Method of allocating clinical pharmacy activity records to the patient episode number (PAS = patient administration system)**

The disease classification structure used to assign the diagnosis-related group to each patient episode was the Australian refined diagnosis-related group structure.[14] Within this structure, diseases affecting a particular body system have a designated major disease classification (MDC), e.g. MDC 01 is diseases and disorders of the nervous system. Different

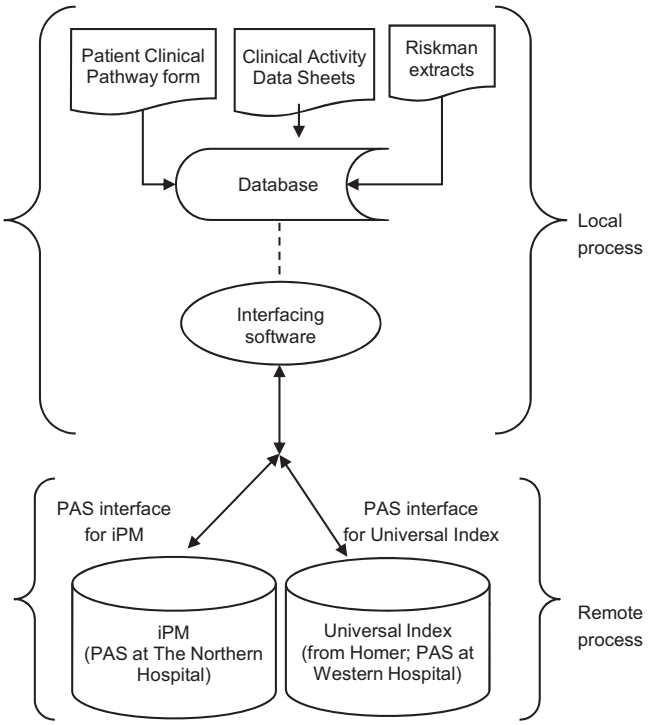


**Figure 2. Interfacing software linking the database and the two patient administration systems (PAS) allows linking of pharmacy activity data with patient episode data from the PAS**

diseases within a major disease classification can be of a medical, surgical or other nature, where the latter refers to diagnostic procedures such as endoscopy or telemetry.[14] Finally, each disease has a specific diagnosis-related group classification, which can exist in a 'complicated' form (with the existence of comorbidities or complications) or in an 'uncomplicated' form.[14]

Extraction of the diagnosis-related group classification allowed the identification of the nature of patient presentation as medical, surgical or other. It also allowed identification of the major disease classification associated with each diagnosis-related group classification. For each patient it was possible to indicate each episode as complicated (presence of severe or catastrophic comorbidities or complications) or uncomplicated.

Reports extracted from the customised database detailed for each record type (PCP forms, CADS records, intervention extracts), the activities linked to each unique patient episode number. The researchers then linked the data for each unique patient episode number together, to produce a record of total clinical pharmacy activities performed for each patient episode. This enabled the analysis of patient episodes for the effects of patient type, major disease classification and patient complexity on workload. It also enabled the analysis of all component activities of the completed patient episodes.

The results represent an analysis of the clinical activities performed by pharmacists during those intervals where they recorded the time needed to perform clinical activities (i.e. time sampling intervals). The results include those for the aggregate of activities comprising completed patient episodes, where all recorded activities took place within the time sampling intervals.

## RESULTS

Over the five months of the study, there were 3701 eligible patient separations (patients discharged) from the medical and surgical wards at The Northern Hospital and 3920 eligible patient separations from the Western Hospital. The number of patients for whom there was a record of clinical pharmacy activity performed was 2210 at The Northern Hospital and 2415 at the Western Hospital.

Pharmacists recorded the time to conduct the medication history interview and medication reconciliation on the PCP form on 2605 occasions. During time sampling intervals, the numbers of activities with times recorded on the CADS for the component activities were: medication order review 2603, clinical review 1330, adverse drug reaction management 9, therapeutic drug monitoring 190 and provision of drug information 387. Pharmacists recorded the times needed for interventions to treatment on 575 occasions during time sampling intervals. There were 1071 completed patient episodes where all of the recorded activities took place within the time sampling intervals.

An analysis of the times required to conduct the medication interview and medication reconciliation is shown in Tables 1 and 2. For all 2605 observations, the mean time required was 9.6 (SD 4.9) minutes. From the diagnosis-related group classifications, medical patients required a mean time of 10.2 (SD 4.8) minutes and this was significantly more than the mean time of 8.2 (SD 4.9) minutes required for surgical patients ($p < 0.0001$). For 'complicated' patients the mean time was 10.5 (SD 4.9) minutes, significantly greater than the mean time for uncomplicated patients, 8.9 (SD 4.7) minutes ($p < 0.0001$).

The mean time for pharmacists' interventions in all the patients was 5.7 (SD 4.6) minutes. In medical patients, the mean time for an intervention was 6.1 (SD 5.1) minutes and this was significantly greater than for surgical patients, 4.6 (SD 3.1) minutes ($p = 0.0003$). In complicated patients, the mean time for an intervention was 6.2 (SD 5.2) minutes, significantly greater than for uncomplicated patients, 5.2 (SD 3.7) minutes ($p = 0.0089$).

On the CADS for medication order review and clinical review, longer activity times were required for medical patients compared to surgical patients (Table 1) and for complicated patients compared to uncomplicated patients (Table 2). For other activities recorded on the CADS during the time sampling intervals, adverse drug reaction management required a mean of 6.0 (SD 5.8) minutes, therapeutic drug monitoring required

**Table 1. Times taken by pharmacists to undertake clinical activities and for completed patient episodes during the time sampling intervals according to the type of patient presentation (medical, surgical or other)**

| Clinical activities | All patients (min) | Medical (min) | Surgical (min) | Other (min) | |
|---|---|---|---|---|---|
| **Medication history interview and medication reconciliation (conducted via Pharmaceutical Clinical Pathway)** | | | | | |
| Mean | 9.6 (SD 4.9) | 10.2 (SD 4.8) | 8.2 (SD 4.9) | 9.5 (SD 4.7) | M>S $p < 0.0001$ |
| No. patients | 2605 | 1734 | 639 | 232 | |
| **Interventions** | | | | | |
| Mean | 5.7 (SD 4.6) | 6.1 (SD 5.1) | 4.6 (SD 3.1) | 6.4 (SD 4.0) | M>S $p = 0.0003$ |
| No. patients | 575 | 376 | 162 | 37 | |
| **Medication order review** | | | | | |
| Mean | 3.5 (SD 2.2) | 3.6 (SD 2.2) | 3.2 (SD 2.0) | 3.8 (SD 2.6) | M>S $p = 0.0002$ |
| No. patients | 2603 | 1568 | 879 | 156 | |
| **Clinical review** | | | | | |
| Mean | 5.5 (SD 4.0) | 6.1 (SD 4.4) | 4.1 (SD 2.8) | 5.4 (SD 3.5) | M>S $p < 0.0001$ |
| No. patients | 1330 | 866 | 363 | 101 | |
| **Episode totals** | | | | | |
| Mean | 14.4 (SD 10.9) | 15.8 (SD 11.1) | 11.0 (SD 9.1) | 15.7 (SD 11.8) | M>S $p < 0.0001$ |
| No. patients | 1071 | 677 | 297 | 97 | O>S $p = 0.0002$ |

M = Medical; S = Surgical; O = Other

**Table 2. Times taken by pharmacists to undertake clinical activities and for completed patient episodes during the time sampling intervals according to the complexity of the diagnosis-related group classification**

| Clinical activities | All patients (min) | Complicated (min) | Uncomplicated (min) | |
|---|---|---|---|---|
| **Medication history interview and medication reconciliation (conducted via Pharmaceutical Clinical Pathway)** | | | | |
| Mean | 9.6 (SD 4.9) | 10.5 (SD 4.9) | 8.9 (SD 4.7) | C>U $p < 0.0001$ |
| No. patients | 2605 | 1172 | 1433 | |
| **Interventions** | | | | |
| Mean | 5.7 (SD 4.6) | 6.2 (SD 5.2) | 5.2 (SD 3.7) | C>U $p = 0.0089$ |
| No. patients | 575 | 311 | 264 | |
| **Medication order review** | | | | |
| Mean | 3.5 (SD 2.2) | 3.6 (SD 2.3) | 3.3 (SD 2.0) | C>U $p = 0.0043$ |
| No. patients | 2603 | 1309 | 1294 | |
| **Clinical review** | | | | |
| Mean | 5.5 (SD 4.0) | 5.8 (SD 4.1) | 5.2 (SD 4.0) | C>U $p = 0.0129$ |
| No. patients | 1330 | 657 | 673 | |
| **Episode totals** | | | | |
| Mean | 14.4 (SD 10.9) | 17.4 (SD 12.0) | 12.6 (SD 9.6) | C>U $p < 0.0001$ |
| No. patients | 1071 | 403 | 670 | |

C = complicated; U = Uncomplicated

a mean of 2.8 (SD 2.0) minutes and provision of drug information required a mean of 3.8 (SD 3.1) minutes. There was no difference between medical and surgical patients, or between complicated and uncomplicated patients, for any of these activities.

The mean time to conduct all activities comprising a completed patient episode for all patients was 14.4 (SD 10.9) minutes. The mean time to conduct all activities comprising a completed patient episode for medical patients was significantly greater than that for surgical patients (15.8 SD 11.1 minutes vs 11.0 SD 9.1 minutes; $p < 0.0001$). In complicated patients, the mean time was 17.4 (SD 12.0) minutes, significantly greater than for uncomplicated patients, 12.6 (SD 9.6) minutes ($p < 0.0001$). For episodes with the 'other' diagnosis-related group classification (n = 97), the mean time to conduct all activities (15.7 SD 11.8 minutes) was greater than for surgical patients ($p = 0.0002$). While the 'other' diagnosis-related group category applies largely to diagnostic and endoscopic procedures, the completed patient episodes in this study had an average length of stay of 4.3 (SD 3.2) days. Forty patients received diagnosis-related group classifications relating to gastroscopy for major disease or complex gastroscopy and a further ten patients received an invasive cardiac procedure following myocardial infarction.

The completed patient episodes according to their assigned major disease classification, where the number of episodes comprising each group was around 100 or more are shown in Table 3. It ranks the major disease classifications in order of the decreasing duration required to provide clinical pharmacy services per episode. Diseases of the circulatory system required the greatest amount of time while diseases of the hepatobiliary systems required the least. There was a difference of more than 50% in the amount of pharmacist time required for these two forms of patient presentation. The time required for complicated and uncomplicated diagnosis-related group presentations, where there were around ten or more episodes in each sample is also shown in Table 3. Within each pair, the 'complex' presentation required the most time. The average time needed to provide clinical pharmacy services for the pooled medical patients in this subset of data was 19.7 (SD 13.6) minutes; the pooled data for surgical patients was 12.7 (SD 9.2) minutes ($p = 0.0008$). For complicated patients (diagnosis-related group description includes the term 'with catastrophic or severe comorbidities or complications') the mean time was 20.0 (SD 13.6) minutes compared to 14.9 (SD 11.1) for uncomplicated patients (diagnosis-related group

**Table 3. Times required for completed patient episodes according to major disease and diagnosis-related group classifications**

| Code | Description | Mean (min) | SD (min) | No. patients |
|---|---|---|---|---|
| **Major disease classification** | | | | |
| 5 | diseases/disorders of the circulatory system | 18.1 | 14.2 | 147 |
| 4 | diseases/disorders of the respiratory system | 16.4 | 10.5 | 185 |
| 1 | diseases/disorders of the nervous system | 14.6 | 8.6 | 92 |
| 6 | diseases/disorders of the digestive system | 14.2 | 10.7 | 208 |
| 8 | diseases/disorders of the musculoskeletal system | 13.6 | 10.8 | 105 |
| 7 | diseases/disorders of the hepatobiliary system | 11.9 | 10.1 | 84 |
| **Diagnosis-related group classification** | | | | |
| E65A | Chronic obstructive airways disease with catastrophic or severe comorbidities or complications | 19.5 | 11.7 | 54 |
| E65B | Chronic obstructive airways disease without catastrophic or severe comorbidities or complications | 15.0 | 8.9 | 20 |
| F62A | Heart failure and shock with catastrophic or severe comorbidities or complications | 26.6 | 23.5 | 13 |
| F62B | Heart failure and shock without catastrophic or severe comorbidities or complications | 20.4 | 13.0 | 31 |
| G02A | Major small and large bowel procedures with catastrophic or severe comorbidities or complications | 22.5 | 8.2 | 10 |
| G02B | Major small and large bowel procedures without catastrophic or severe comorbidities or complications | 10.6 | 8.1 | 9 |
| H08A | Laparoscopic cholecystectomy with closed common duct exploration with catastrophic or severe comorbidities or complications | 12.6 | 9.0 | 11 |
| H08B | Laparoscopic cholecystectomy without closed common duct exploration without catastrophic or severe comorbidities or complications | 9.3 | 7.4 | 23 |

ANOVA between groups; $F = 4.685$, $p = 0.0003$

**Table 4. Analysis of patient presentation according to disease complexity and ranked according to the times required for completed patient episodes**

| Group | Patient type | Diagnosis-related group complexity | Mean time (min) | Group mean time (min) | Group 95%CI (min) | No. patients |
|---|---|---|---|---|---|---|
| 1 | Surgical | uncomplicated | 9.6 | 9.6 | 8.2-11.0 | 221 |
| 2 | Medical | uncomplicated | 13.9 | 14.3 | 13.4-15.2 | 365 |
| | Surgical | complicated | 14.9 | | | 77 |
| | Other | uncomplicated | 15.5 | | | 84 |
| 3 | Other | complicated | 17.1 | 18.0 | 16.9-19.2 | 13 |
| | Medical | complicated | 18.1 | | | 313 |

ANOVA between groups; $F = 43.29$, $p < 0.0001$

description includes the term 'without catastrophic or severe comorbidities or complications) ($p = 0.0087$) (Table 3). Table 4 shows times for completed episode totals, further analysed according to diagnosis-related group complexity within patient types and ranked according to the times required to provide clinical pharmacy services to these groups of patients.

## DISCUSSION

The results of this study represent activities recorded by pharmacists during the time sampling intervals—blocks of five working days once every four weeks over a five-month period. As the activities were discrete and complete at the time of recording, it was expected that they would be reflective of all the activities conducted over the duration of the study. However, episodes that included data recorded outside the five day time sampling intervals were excluded from analysis and these would have included longer episodes extending beyond the sampling intervals. The episode totals reported thereby represent a subset of episodes with shorter lengths of stay.

A 2006 analysis of the Australian pharmacy workforce, attempted to forecast the clinical pharmacist workforce needed to meet the requirements of the Australian Health Ministers' recommendation for the provision of pharmaceutical review for inpatients.[15] This included estimates of the beds to pharmacist ratios for the provision of 'comprehensive' clinical pharmacy services and 'basic' clinical pharmacy services.

A 'comprehensive' clinical pharmacy service was characterised as the Society of Hospital Pharmacists of Australia's definition of a 'basic' clinical pharmacy service plus the additional services to achieve Principles 6, 8, 9 and 10 of the Australian Pharmaceutical Advisory Council's guidelines to achieve continuity in medication management.[16,17] A 'basic' clinical pharmacy service was defined to comprise an accurate medication history interview, assessment of current medication management and the provision of medicines information to patients.[16] The recommended beds to pharmacist ratio was 55 beds for medical patients and 62 beds for surgical patients, in an eight-hour day. This represents average daily time allocations per patient of 8.7 and 7.7 minutes for medical and surgical patients, respectively.

In this present study, the time required to conduct a medication history interview and medication reconciliation on admission was around 10 minutes. The interventions to treatment and clinical review of the medical record or pathophysiology results both required about 5.5 minutes and medical order review required about 3.5 minutes. Medical patients and those with comorbidities and complications compounding their treatment were predictors of longer times to conduct these activities in all cases. These findings can be applied to the recently proposed beds to pharmacist ratios for the provision of 'basic' clinical pharmacy services.[15]

A pharmacist with a daily case load of 55 medical beds to which they are providing a 'basic' clinical pharmacy service, could expect ten new patients requiring admission interviews as well as interventions to correct medication admission errors and for other therapeutic recommendations. Approximately ten patients would need provision of medicines information on discharge and the remaining 45 patients would require ongoing medication management assessment. From the present study the activity times for medical patients indicates that a pharmacist could potentially achieve this in an eight-hour day. A similar conclusion could also apply to the recommended bed ratio for a 'basic' clinical pharmacy service to surgical beds.

However, higher patient turnovers and other factors such as the elements of travelling and unproductive time, would affect the ability to achieve these ratios. These factors, along with the assistance to prescribers with the Pharmaceutical Benefits Scheme, and involvement in clinical education, reduce the likelihood of achieving the proposed bed ratios.[18,19] Furthermore, a pharmacist's duty of care requires the pursuit of medication safety and therapeutic goals and this may be compromised by restricting the level of service to a 'basic' level for all patients. The data from the present study can thereby provide only qualified support for the proposed ratios for the provision of basic clinical pharmacy services to medical and surgical beds.[15]

In 1993, Howitt measured hospital pharmacy services provided to individual patient episodes of care. The provision of services was not quantified in units of time but expressed as clinical pharmacy workload in terms of the number of activities provided, multiplied by a 'relative value unit' for each type of service.[20] Patient episodes fell into four groups that were classified according to the required clinical pharmacy input. The identified groupings were in ascending order of the input required as follows:[20]

1. those with a shorter length of stay (investigative or minor surgical procedure);
2. those with a general medical disorder requiring intermittent hospitalisation;
3. those requiring complex medical care (diabetes, receiving chemotherapy); and
4. those requiring intensive care or undergoing significant surgical or medical care.

Caution is required when comparing data from the present study with Howitt's report as different types of patient episodes were analysed. Howitt included day-admitted patients, intensive care patients, patients undergoing chemotherapy and patients receiving organ transplants. The present study involved overnight patients under the care of general medical and surgical units. Also in the present study, the subset of patients included had relatively short lengths of stay whereas Howitt included all completed episodes for which data were available. Notwithstanding the above differences, comparison shows that the pharmaceutical input required for completed patient episodes in our study was in the following ascending order (Table 4):

1. surgical patients without a diagnosis-related group comorbidity or complexity;
2. medical patients without a diagnosis-related group comorbidity or complexity, patients undergoing less complicated investigations and surgical patients with a diagnosis-related group comorbidity or complexity; and
3. medical patients with a diagnosis-related group comorbidity or complexity and patients undergoing relatively complex investigational procedures.

There is a degree of similarity between these classifications and those reported by Howitt. In both studies, uncomplicated surgical patients required the least input and complex medical patients the most, and uncomplicated medical patients and complex surgical patients required intermediate input.

This study to our knowledge is the first published work that attributes the time to perform clinical pharmacy activities for individual patients. It has allowed the determination of average times needed to perform these activities and the identification of factors (type of patient presentation – medical or surgical – the major disease classification and the complexity of the individual diagnosis-related group presentation) that influenced these average times. Our study has provided new

information about the influence of comorbidities and complications accompanying a patient's presentation. The diagnosis-related group classification is not assigned until well after discharge and thereby cannot influence in advance the activities to be performed. It is thereby apparent that factors that determine the eventual diagnosis-related group classification also prospectively influence medication management activities by the pharmacist.

The study also provides information about the influence of the above factors on the total time commitments by pharmacists for completed patient episodes. However, this information only relates to patients with relatively short lengths of stay. Nevertheless, the influences on time commitments on the patient subset in our study confirmed the patterns indicated in an earlier report.[20] The presentation of the complete data collected in our study involves a statistical imputation of times associated with activities recorded during non-time-sampling intervals and is forthcoming. This will provide information about clinical pharmacy commitments for longer patient episodes.

A limitation of the study was that of the different levels of experience of pharmacists providing clinical services to patients. Pharmacists ranged in experience from newly qualified to those with many years of experience in hospital practice. Conversely, this can also be interpreted as a strength of the study as it reflects the 'real world' environment. The managers at the pharmacy departments deployed pharmacists to clinical areas according to operational requirements; the researchers did not attempt to influence the alignment of pharmacists' experience with particular clinical areas. However, all participating pharmacists used the same recording tools and received the same training and education in their use. Another limitation was the use of a self-reporting method to record the times required by pharmacists to perform each activity, rather than using independent observers. Using independent observers would have reduced the amount of data collected and may have also influenced the times recorded.[18] Rather, we provided a training session to pharmacists prior to each time sampling interval to ensure consistent recording of the time taken to perform the various activities. Finally, the study method clearly confines our results to clinical pharmacy activities for patients treated in the medical and surgical wards of general hospitals. Our study did not include emergency or intensive care patients, patients undergoing chemotherapy or patients undergoing highly specialised treatment, such as organ transplantations.

In conclusion, the time needed to provide clinical pharmacy services for individual patient episodes for medical and surgical patients was successfully quantified. Further analysis of data collected will allow determination of total clinical pharmacy workload for longer patient episodes, providing a more complete assessment of the workload commitments of different patient presentations in medical and surgical wards.

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