

Comparison of the Completeness of Prescription Medication Histories for Hospitalized Geriatric Patients Documented by Different Health Care Professionals

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ABSTRACT

Objective: The primary objective of this study was to evaluate the completeness of medication-history information for hospitalized geriatric patients documented by various health care professionals. A secondary objective was to assess the utility of the computerized prescription database PharmaNet for identifying medications taken before admission to hospital and drug-related problems related to these medications.

Methods: A retrospective review of 55 charts from patients over age 65 years admitted to hospital between November 1999 and February 2000 who had taken at least one prescription medication before admission to hospital.

Results: Pharmacists tended to identify a higher proportion of medications taken before admission than other professionals (76% ± 25% versus 70% ± 29%, $p = 0.25$). Pharmacists' use of PharmaNet did not seem to affect the proportion of identified medications taken before admission (76% ± 21% versus 77% ± 30%, $p = 0.94$); however, patients for whom PharmaNet was used had taken more medications before admission (7.0 ± 2.8 versus 5.4 ± 2.8, $p = 0.10$). More drug-related problems per patient were documented when PharmaNet was used (1.5 ± 1.3) than when PharmaNet was not used (0.6 ± 0.9) ($p = 0.02$), whereas the mean severity index of drug-related problems was similar (1.4 ± 0.6 versus 1.2 ± 0.4). The most common category of drug-related problems documented with PharmaNet use was an untreated indication.

Conclusions: Pharmacists may document the most comprehensive medication-history information for geriatric patients, but the use of PharmaNet did not seem to significantly enhance the completeness of the information obtained. More drug-related problems were documented when PharmaNet was reviewed, but it was unclear whether this was attributable to the use of PharmaNet. Although prescription databases are a convenient source of medication-history information, pharmacists may also need to talk to patients directly to obtain complete data. A prospective, randomized study using a definitive assessment of

RÉSUMÉ

Objectif : Le principal objectif de cette étude était d'évaluer l'exhaustivité de la documentation, par les divers professionnels de la santé, de l'histoire médicamenteuse des patients âgés hospitalisés. L'objectif secondaire était d'évaluer l'utilité de la base de données informatique sur les ordonnances, PharmaNet, pour dépister les médicaments que prenaient ces patients avant leur hospitalisation ainsi que les problèmes pharmacothérapeutiques liés à ces médicaments.

Méthodes : Une analyse rétrospective de 55 dossiers de patients âgés de plus de 65 ans, qui avaient été admis à l'hôpital entre novembre 1999 et février 2000, et qui avaient pris au moins un médicament d'ordonnance avant leur hospitalisation a été menée.

Résultats : Les pharmaciens avaient tendance à identifier un plus grand nombre de médicaments pris avant l'admission, que les autres professionnels de la santé (76 % ± 25 % vs 70 % ± 29 %, $p = 0,25$). L'utilisation de PharmaNet par les pharmaciens n'a cependant pas semblé avoir d'effet sur la proportion des médicaments pré-admission identifiés (76 % ± 21 % vs 77 % ± 30 %, $p = 0,94$). En revanche, les patients pour lesquels les pharmaciens ont eu recours à PharmaNet prenaient un plus grand nombre de médicaments avant leur admission (7,0 ± 2,8 vs 5,4 ± 2,8, $p = 0,10$). Par ailleurs, le nombre de problèmes reliés à la pharmacothérapie documentés lorsque PharmaNet était utilisé était de 1,5 ± 1,3 par patient, comparativement à 0,6 ± 0,9 lorsque PharmaNet n'était pas utilisé ($p = 0,02$), alors que l'indice de gravité moyen de ces problèmes était semblable (1,4 ± 0,6 vs 1,2 ± 0,4) dans un cas comme dans l'autre. La catégorie de problèmes reliés à la pharmacothérapie la plus fréquemment documentée avec l'utilisation de PharmaNet était l'absence de traitement pour une indication valide.

Conclusions : Les pharmaciens documentent peut-être de façon plus exhaustive l'histoire médicamenteuse des patients âgés, mais l'utilisation de PharmaNet n'a pas semblé accroître significativement l'exhaustivité de l'information obtenue. Toutefois, le recours à PharmaNet a permis de documenter un



medications taken before admission as a comparator is required before firm conclusions can be drawn.

Key words: medication history, geriatrics, completeness, drug-related problems, prescription database

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INTRODUCTION

To prescribe safely, physicians must know which medications their patients are using.¹ However, medication histories documented in hospital medical records are often inaccurate,^{2,4} and these inaccuracies may be the source of drug-related problems. Since most adverse drug events are avoidable,⁵ their prevention has become a high priority for health care professionals.⁶

Because advancing age increases the risk of chronic illness, geriatric patients are more likely to require drug treatment and often require more medications than younger patients.⁷ The greater use of medications is a risk factor for inaccurate documentation of medication history, which is reflected in the frequency with which errors are found in elderly patients' hospital records.¹ Further, it is well documented that seniors are at higher risk for adverse drug events.^{8,9} Up to 19% of hospital admissions of older people in Canada are the result of drug-related adverse patient events.¹⁰ As many as 15% of hospitalized elderly patients experience preventable adverse drug events.^{10,11}

Recently, licensed pharmacists were given access to PharmaNet in British Columbia hospitals. PharmaNet is a provincial computer database that records medication information for all prescription transactions processed by community pharmacies in British Columbia,¹² regardless of patient age, payment method, or insurance coverage. Previous research^{13,14} using this database has suggested that underreporting and misclassifications within the database are minimal. Prescriptions filled for institutionalized patients are not recorded in PharmaNet, and hospital pharmacists are not required to review PharmaNet for dispensing or for clinical purposes. Pharmacists' use of this database is anticipated to facilitate accurate medication history-taking for

plus grand nombre de problèmes reliés à la pharmacothérapie, bien qu'on ne puisse dire clairement si cela était attribuable à son utilisation. Malgré que les bases de données sur les ordonnances constituent une source pratique d'information sur l'histoire médicamenteuse, les pharmaciens pourraient devoir s'adresser aux patients directement afin d'obtenir des renseignements complets. Une étude prospective et randomisée, faisant appel à une évaluation définitive des médicaments pris avant l'admission des patients à titre de groupe témoin, est nécessaire avant de pouvoir tirer des conclusions certaines.

Mots clés : histoire médicamenteuse, gériatrie, exhaustivité, problèmes reliés à la pharmacothérapie, base de données sur les ordonnances

hospitalized patients, which could be used to identify, prevent, and resolve drug-related problems. However, hospital pharmacists have found the use of PharmaNet time-consuming because access to it is restricted to a small number of terminals in secured areas and information cannot be sorted or searched.

The goal of this study was to evaluate the completeness of the information about geriatric patients' medication histories documented by various health care professionals and to assess the utility of PharmaNet for identifying medications taken before admission, as well as drug problems related to these medications.

METHODS

This study was carried out at St Paul's Hospital in Vancouver, British Columbia, a 500-bed teaching institution, with 48 of these beds allocated to general medicine and another 11 to geriatric medicine. A list of patients over the age of 65 years admitted to St Paul's Hospital for at least 3 days between November 1, 1999, and February 28, 2000, was generated by the hospital's Medical Records Department. From the 1200 names on the list, patients were randomly chosen and a chart review carried out as described below.

After 52 charts had been completed, only 6 involved cases in which pharmacists had used PharmaNet to obtain medication-history information. To obtain more data about PharmaNet use, additional charts were randomly selected from a list of patients maintained by the Pharmacy Department that included only cases for which PharmaNet was used. Inclusion criteria were the same as those outlined above. Fourteen additional charts were selected for review in this manner. The sample size of 52 charts selected for the Medical Records Department list, plus 14 charts selected from the



Pharmacy Department list, was based on the time the pharmacy resident had available to complete the chart review. At this point, charts in which there was no evidence of patients taking medications before admission to hospital were excluded from the analysis.

One pharmacy resident carried out a retrospective chart review of all charts included in the study. The resident was given thorough training in this process by the department's research coordinator who carried out several spot checks to ensure accurate data collection. Data were also collected from pharmacists' clinical monitoring forms for the patients whose charts were included in the study. These forms contained extensive information about drug-related problems, but were not included as a permanent part of the patients' medical chart. Data collected were patient demographics; duration of hospital stay; prescription medications used before admission, identified in the chart; and pharmacists' documented use of PharmaNet. The total number of medications taken before admission listed in each section in the chart and the profession of the person documenting each list were noted. The list of medications taken before admission was calculated by tallying all the different medications documented in all parts of the chart and in the pharmacists' clinical monitoring forms. Since the PharmaNet database records information about prescription medications only, over-the-counter and complementary or alternative medications were not included in the analysis.

The number and type of drug-related problems documented in the medical record that were related to

the list of medications taken before admission were identified and categorized with criteria described by Strand and others.¹⁵ Only drug-related problems involving medications that patients had taken before admission were considered. The severity rating assigned to each drug-related problem was designed to reflect the potential for harm to the patient if unresolved (1 = no apparent harm, 2 = potential harm, 3 = harmful). This severity rating was described by Chase and Bainbridge¹⁶ and has been used in previous studies^{17,18} in which drug-related problems were identified. When an identified drug-related problem involved no treatment for a documented medical condition (i.e., an "untreated indication"), an effort was made to verify that therapy was indicated. For example, a drug-related problem would not be recorded for patients who had antihypertensive medication temporarily discontinued on admission to hospital for hypotension. Drug-related problems were considered resolved, based on evidence from the medical chart and the pharmacy monitoring form, including physicians' and nurses' notes, vital-sign documentation, and prescription records.

Data were summarized with descriptive statistics. Values are expressed as means \pm standard deviation. The Kruskal–Wallis test was used to compare the proportion of before-admission medications documented in the medical records between health care professions (see categories used in Table 1). Although samples were not entirely independent (i.e., some patients' medication histories were documented by more than one health care professional), there was insufficient overlap to

Table 1. Completeness of Before-Admission Prescription Medication Lists Documented by Various Health Care Professionals

Health Care Professional	No. of Documented Medication Histories†	Before-Admission Medications* (mean \pm SD)		
		No.	Proportion Documented (%)‡	No. Not Documented§
Physicians				
Staff	29	5.5 \pm 3.6	70 \pm 24	1.8 \pm 2.2
Residents	22	5.6 \pm 2.8	69 \pm 29	2.1 \pm 2.0
Nurses	63	5.0 \pm 3.1	74 \pm 31	1.6 \pm 2.2
Paramedics	21	5.0 \pm 2.6	63 \pm 27	2.2 \pm 1.9
Pharmacists				
With PharmaNet	18	7.0 \pm 2.8	76 \pm 21	1.6 \pm 1.4
Without PharmaNet¶	16	5.5 \pm 3.0	77 \pm 30	1.4 \pm 1.6

SD = standard deviation.

*Patients with no before-admission medications were excluded from the analysis.

†Some charts had more than one medication history documented by a professional group (e.g., emergency room nurse and ward nurse).

‡No significant difference was found between health care professionals (Kruskal–Wallis test, $p = 0.47$).

§No significant difference was found between health care professionals (Kruskal–Wallis test, $p = 0.52$).

||Pharmacists' medication histories were taken from the pharmacists' monitoring forms, which were not part of the permanent health care record.

¶Two of the 18 pharmacists' monitoring forms in this category that did not document medications taken before admission were excluded from this analysis.



Table 2. Drug-Related Problems Documented in the Medical Record, According to Pharmacist Activity

	Pharmacist		
	Did Not See Patient (n = 19)	Documented without PharmaNet (n = 18)	Documented with PharmaNet (n = 18)
No. of before-admission medications (mean ± SD)	4.0 ± 2.8	5.4 ± 2.9	7.0 ± 2.8
No. of documented drug-related problems per patient (mean ± SD)	0.3 ± 0.7	0.6 ± 0.9	1.5 ± 1.3
Severity index* (mean ± SD)	1.3 ± 0.5	1.2 ± 0.4	1.4 ± 0.6
No. of drug-related problems resolved during hospital stay (%)	29	20	55

SD = standard deviation.

*1 = no apparent harm, 2 = potential harm, 3 = harmful.

justify the use of paired or repeated measures analysis. All other means compared were analyzed with a two-sided Student *t*-test for independent samples. A *p* value of 0.05 was considered statistically significant.

RESULTS

Of the charts for 52 patients randomly selected from the Medical Records Department list, 22 (42%) patients were seen by a clinical pharmacist during their admission, and medication-history information for 6 (27%) of these 22 patients was obtained from PharmaNet.

From the charts for 66 patients in total (52 from the hospital's Medical Records Department and 14 from the Pharmacy Department's list), charts for 11 were excluded because there was no evidence of any prescription medications taken before admission. This left a total of 55 charts for analysis: 19 for patients who were not seen by a clinical pharmacist, 18 for patients who were seen by a clinical pharmacist and for whom no PharmaNet review was carried out, and 18 for patients who were seen by a clinical pharmacist and for whom a PharmaNet review had been conducted. The mean age of these 55 patients was 75 ± 8 years, and the mean duration of their hospital stay was 13.2 ± 12.5 days. The majority (69%, 38/55 patients) of patients were male. Of those for whom a PharmaNet review was conducted, the mean time after admission until PharmaNet was accessed was 3.8 ± 4.5 days.

Evaluation of the data by profession revealed that pharmacists recorded the highest proportion of medications taken before admission and the fewest number of missed medications, regardless of whether PharmaNet was reviewed (Table 1). However, the variation within these results was large, and the differences between them were not statistically significant. When medication histories documented by pharmacists were compared with the composite of all other professions, the differences were still not

statistically significant, neither when evaluated as a proportion of medications taken before admission (76% ± 25% versus 70% ± 29%, *p* = 0.25), nor when evaluated as the number of missed medications (1.5 ± 1.5 versus 1.9 ± 2.3, *p* = 0.34). The use of PharmaNet did not seem to enhance the completeness of medication-history information pharmacists obtained, whether evaluated by the proportion of documented medications taken before admission (76% ± 21% versus 77% ± 30%, *p* = 0.94) or evaluated by the number of medications taken before admission that were missed (1.6 ± 1.4 versus 1.4 ± 1.6, *p* = 0.74). More drug-related problems relating to medications taken before admission per patient were documented when PharmaNet was used to obtain a medication history (1.5 ± 1.3 versus 0.6 ± 0.9, *p* = 0.02) (Table 2). However, patients for whom PharmaNet was reviewed tended to take more prescription medications before admission than those for whom PharmaNet was not reviewed (7.0 ± 2.8 versus 5.4 ± 2.8, *p* = 0.10). Without the use of PharmaNet, pharmacists documented more drug-related problems than other health care professionals when taking medication histories; however, the highest number of drug-related problems was identified when a pharmacist used PharmaNet. The mean severity index of drug-related problems was similar, regardless of whether PharmaNet was used. Most drug-related problems identified with PharmaNet were related to medical conditions for which patients did not receive therapy in hospital (i.e., "untreated indication") (Table 3), and more of these problems involved cardiovascular medications than any other medication (Table 4).

DISCUSSION

The results of the current study suggest that pharmacists may obtain more complete histories of a patient's use of prescription medication than other health care workers. However, because the variability in



Table 3. Types of Drug-Related Problems Documented in Medical Records of Patients for Whom PharmaNet Was Reviewed

Type of Drug-Related Problem	No. (%) (n = 29)
Untreated indication	17 (59)
Dose too high	3 (10)
Dose too low	3 (10)
Inappropriate drug or formulation	3 (10)
Adverse drug reaction	2 (7)
Drug use without indication	1 (3)

the data was large, the difference was not statistically significant. Since taking medication histories is a focus of pharmaceutical care, pharmacists may spend more time obtaining medication information than other health care professionals. Also, pharmacists likely have a broader knowledge of available pharmacy products, which enables them to pose more specific drug-related questions during a patient interview.

Results from several previous studies²⁻⁴ suggest that pharmacists obtain more accurate medication histories than physicians. However, it is difficult to define a preferred standard for comparison. Badowski and others² attempted to assess this issue by validating a questionnaire on simulated patients. In the validation study, pharmacists obtained 100% of the information about prescription and nonprescription medications from the simulated patients, whereas physicians obtained 79% of the information about prescription drugs and 45% of that about nonprescription drugs. Once validated, pharmacists used the questionnaire for 80 newly admitted medical and surgical patients, and their results were compared with the medication histories documented by physicians. Pharmacists obtained at least one additional piece of information for 95% of patients. At least 2 studies^{2,4} have concluded that information about medication histories that physicians miss is clinically important.

The results from the current study suggest that a computer prescription database is a valuable tool for obtaining medication histories, but that information about medication histories should not be limited to one resource. As assessed in this study, the use of PharmaNet did not seem to influence pharmacists' identification of the proportion of medications taken before admission. In the authors' experience, patients often start and stop medications, contrary to written prescriptions, with or without the advice of the prescriber. For example, patients may take medications

Table 4. Drug Categories of Drug-Related Problems Documented in Medical Records of Patients for Whom PharmaNet Was Reviewed

Drug Category	No. (%) (n = 29)
Cardiovascular	14 (48)
Central nervous system	5 (17)
Gastrointestinal	4 (14)
Ophthalmic	3 (10)
Antibiotics	1 (3)
Antineoplastic	1 (3)
Endocrine	1 (3)

they have left over from previous personal prescriptions, or they may take medication prescribed for other family members. Specific questioning during an interview may be the only way of revealing this type of behaviour. A prescription database may not, therefore, accurately reflect the number of medications a patient is taking. On the other hand, patients for whom PharmaNet was reviewed in the current study took more medications before admission to hospital, suggesting that pharmacists spent the extra time to review PharmaNet only for patients with more complex medical histories. This potential selection bias makes a comparison between groups for whom PharmaNet was reviewed or not reviewed difficult, and likely contributed to the higher number of drug-related problems identified for PharmaNet patients.

The unique information available in PharmaNet may also have contributed to its greater identification of drug-related problems. For example, the PharmaNet profile can be used to identify prescription medications that patients do not mention during an interview. Accordingly, the most common type of drug-related problem identified with the use of PharmaNet was an untreated indication. Previous research¹⁹ has identified that seniors' underuse of beneficial drug therapy is associated with increased morbidity, mortality, and reduced quality of life. Further, PharmaNet provides detailed dosing information. Dosing issues were amongst the most common drug-related problems identified when PharmaNet was reviewed. PharmaNet can also be useful for assessing medication adherence through a comparison of refill rates and quantity issued.

PharmaNet was used for only 11% of the 52 patients randomly selected from the charts from the Medical Records Department. No formal policy exists within the St Paul's Hospital Pharmacy Department specifying which patients should be seen by a pharmacist for a



thorough medication history or when PharmaNet should be used. When it was used, PharmaNet was not accessed for an average of almost 4 days after the patient was admitted to hospital. This may have been because reviewing PharmaNet was considered too time-consuming for routine use at the time of admission and was done only when specific details of the patient's history suggested it might be useful.

Previous work^{20,21} suggests that prescription databases are an accurate means of identifying drugs dispensed to individual patients. One study²⁰ has demonstrated good agreement between computerized prescription records and written prescription records from a medical clinic. Information in prescription databases is also similar to that obtained from self-administered medication-history questionnaires.²¹ However, previous work suggests that medication histories documented in hospital records are often inaccurate. Beers and others¹ reported that 83% of medication histories recorded for persons over the age of 65 years had at least one error when compared with information obtained during a structured interview. The results presented here suggest that the completeness of medication-history information varies with the profession of the person recording the information. The pharmacists' monitoring form, which was not a part of the health care record at St Paul's Hospital, included the highest proportion of medications taken before admission, according to the definition used in this study, regardless of whether PharmaNet was reviewed.

The current study has several limitations. First, it was not possible to validate the accuracy of the list of the medications patients took before admission. It is possible that medications listed in some sections of the health care record or in PharmaNet were not currently being used by the patient in question. However, it was assumed that patients and family would be unlikely to overreport the number of medications in their current regimen. A previous study¹ demonstrated that hospital records underreport medications taken before admission much more commonly than list medications that patients said they had not used.

Another limitation was the possible bias in the selection of patients for whom PharmaNet was accessed. Pharmacists may have chosen to use PharmaNet for patients who were more likely to experience drug-related problems. PharmaNet access was available on a limited number of computer terminals in the Pharmacy Department, and profiles contained information about all prescriptions filled within the previous 14-month period. As a

consequence, PharmaNet profiles could be complicated and time-consuming to evaluate. Pharmacists were likely to limit the use of PharmaNet to those patients with more complex problems and to those who seemed to be at risk for problems related to medications taken before hospital admission. This assumption seems to be substantiated by the higher number of medications taken before admission for the patients for whom PharmaNet was used.

In most of the charts reviewed for this study, medication-history information was documented by some, but not all, of the professional groups assessed. The interpretation of when documenting medication-history information in the medical record is warranted likely varies among health care professions. This could have resulted in a selection bias that affected the results of this study. For example, if certain professions reserved documentation of medication-history information for patients with more complex medical histories, the documentation of the proportion of medications taken before admission may have been affected. The order in which medication histories were documented could also have been important, since later documentation could have been affected by the details listed by a different health care professional earlier in the chart. A prospective study randomly assigning different health care professionals to take patients' histories could have avoided such bias. More systematic verification of data extraction and validation (i.e., beyond spot checks) could also have helped minimize the possibility of bias during the data-collection process. Finally, since PharmaNet includes only information about prescription medications, over-the-counter and complementary or alternative medicines were not included in the analysis.

Physicians, nurses, pharmacists, and other health care professionals frequently describe the importance and difficulty of obtaining accurate medication histories.^{1,2,22,23} Accurate medication-history information is vital in the prevention of drug-related morbidity and mortality, especially for geriatric patients. These results suggest that pharmacists obtain the most complete medication-history information for geriatric patients, although the difference between that obtained by pharmacists and that obtained by other health care professionals was not statistically significant. The use of a computerized prescription database to obtain medication histories seems to be associated with effective identification of medications taken before admission and resolution of drug-related problems; however, to obtain the most comprehensive information



possible, pharmacists may also need to obtain medication-history information directly from the patient. Future research that uses a prospective, randomized design, and a definitive assessment of medications taken before admission as a comparator is required before firm conclusions can be drawn about the relative completeness of medication-history information obtained by various health care professionals, with and without the use of PharmaNet.

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