

The Impact of a Clinical Pharmacist on Patient and Economic Outcomes in a Child and Adolescent Mental Health Unit

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ABSTRACT

Background and Objective: It has been shown that clinical pharmacists positively influence quality of care and decrease drug expenditures in hospital settings. This 2-part study was undertaken to evaluate the impact of a clinical pharmacist on patient and economic outcomes in a pediatric mental health setting.

Methods: In the first part of the study, a 4-week prospective evaluation period, pharmacist-initiated interventions were documented. This information was distributed to a panel of assessors, who determined the impact of each intervention on patient care. In the second part of the study, a retrospective cost analysis was used to compare drug costs for 2 consecutive years, the 12-month period before and the 12-month period immediately after institution of the clinical pharmacy position. A matched-pair *t*-test and regression analysis were conducted on the cost data.

Results: The pharmacist initiated 48 interventions during the 4-week period, 47 (98%) of which were accepted by the treating physician. Eighty-six percent (38/44) of the interventions were assessed as having a positive effect on patient care. Drug cost per patient-day was 14% lower in the year after implementation of the pharmacy position, and the difference was statistically significant in the last 8 months of that year ($p = 0.0019$). Total drug costs decreased by 21%, a cost saving of \$5485.80.

Conclusions: The clinical pharmacist had a positive impact on both clinical and economic outcomes in this pediatric mental health population.

Key words: intervention, clinical pharmacist, mental health, cost savings

RÉSUMÉ

Historique et objectif : On a démontré que les pharmaciens cliniciens influencent positivement sur la qualité des soins et faisaient baisser le coût des médicaments en milieu hospitalier. Cette étude de deux phases a été menée pour évaluer l'incidence des interventions du pharmacien clinicien en termes de résultats thérapeutiques et de répercussions économiques dans un établissement de soins de santé mentale pour enfants.

Méthodes : Dans la première phase de l'étude, soit une période d'évaluation prospective de quatre semaines, les interventions entreprises par le pharmacien ont été documentées. L'information ainsi recueillie a été distribuée à un comité qui a évalué l'incidence de chaque intervention sur les soins au patient. Dans la seconde phase de l'étude, une analyse rétrospective des coûts — au moyen d'un test de Student apparié et d'une analyse de régression — a été menée pour comparer le coût des médicaments sur une période de deux années consécutives, soit la période de douze mois avant et celle immédiatement après la mise en place du poste de pharmacien clinicien.

Résultats : Des 48 interventions entreprises par le pharmacien durant la période de quatre semaines, 47 (98 %) ont été acceptées par le médecin traitant et 86 % (38/44) se sont révélées avoir un effet positif sur les soins aux patients. Le coût des médicaments par jour-patient était 14 % plus bas dans l'année suivant la mise en place du poste de pharmacien clinicien, et on a observé une différence statistiquement significative dans les huit derniers mois de cette année ($p = 0,0019$). Le coût total des médicaments a diminué de 21 %, ce qui s'est traduit par des économies de 5 485,80 \$.

Conclusion : Le pharmacien clinicien a eu une incidence positive à la fois sur les résultats thérapeutiques et sur les coûts au sein de cette population d'enfants en milieu de soins de santé mentale.

Mots clés : intervention, pharmacien clinicien, santé mentale, réduction de coûts

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INTRODUCTION

Clinical pharmacists can decrease health care costs and improve patient care by initiating interventions to optimize medication use, avoid or mitigate drug-related problems (DRPs) such as adverse drug reactions and drug interactions, ensure the rational use of medications, and improve patient compliance with medications.¹ Numerous studies have reported that the provision of clinical pharmacy services can result in cost savings,^{2,6} cost avoidance,^{7,8} shortened hospital stay, and better patient care.^{2,7,8}

Several studies have documented the effects of a clinical pharmacist in mental health settings.⁹⁻¹⁴ However, many of these studies have focused on pharmacy consultations, whereby pharmacist services are requested by a physician for a specific case, rather than the proactive approach provided by the incorporation of a clinical pharmacist into the care team.¹⁰⁻¹² To our knowledge, no studies have addressed the impact of a clinical pharmacist on clinical or economic outcomes in a pediatric mental health population.

This study had 3 main objectives: to describe and characterize the types of DRPs and resultant pharmacist-initiated therapeutic interventions in a child and adolescent mental health unit; to determine the impact of pharmacist-initiated interventions on patient care, as perceived by health care professionals; and to compare drug budget expenditures in the year before and the year after a clinical pharmacist position was established in a child and adolescent mental health unit.

METHODS

This study was conducted in the 17-bed inpatient child and adolescent mental health unit of the IWK Health Centre, a university-affiliated, tertiary care pediatric hospital serving the Maritime region. The inpatient unit serves patients up to 19 years of age. Common reasons for admission include depression, schizophrenia, substance abuse, bipolar disorder, developmental disorders such as attention-deficit hyperactivity disorder, various anxiety disorders, and eating disorders.

In September 1999, one pharmacist position (0.4 full-time equivalent) was permanently added to the interdisciplinary health care team for patients admitted to this unit. The pharmacist worked on the unit half-days throughout the week. Responsibilities included patient and staff education, patient counselling, attending rounds, providing consultation services, answering drug information questions, providing interdisciplinary staff support, and identifying and preventing or resolving DRPs. The pharmacist hired for this position (A.V.) had prior experience in the field of mental health, but had not previously worked in a pediatric setting.

The study was conducted in 2 parts. First, during a 4-week study period (June 4 to June 29, 2001), the clinical pharmacist recorded all DRPs and subsequent interventions on a standardized form adapted from the literature.^{7,8,15} DRPs were classified into the 8 categories developed by Hepler and Strand¹⁶ and were identified as either actual or potential. To resolve each DRP, the pharmacist made one or more therapeutic interventions. An intervention was defined *a priori* as any pharmacist-initiated suggestion regarding drug therapy but did not include drug information requests. The pharmacist's recommendations were communicated verbally to the psychiatrist and in some instances were also documented as written recommendations in the patient's medical chart.

In a method adapted from the literature, DRPs and corresponding interventions collected during the study period were summarized on a standardized evaluation form.^{4,7,15} The forms were sent to a panel of 3 independent assessors. The panel comprised 2 clinical pharmacists working in a psychiatry setting and a child and adolescent psychiatrist. The assessors rated the perceived impact of each intervention as having a detrimental effect, no effect, or a positive effect (minor, moderate, or marked) on patient care. The assessors also rated each intervention in terms of its potential to increase quality of care, avoid adverse effects, decrease costs, improve response to medication, improve patient adherence to medication, and decrease length of hospital stay. Of the 27 assessment forms prepared, 10 were sent to all members of the panel, to allow calculation of a coefficient of agreement; the remaining forms were distributed among the assessors. The coefficient of agreement among assessors was calculated by dividing the number of observed points of agreement by the total number of possible points of agreement.

The second component of the study was a retrospective cost analysis, conducted to determine the financial impact of having a clinical pharmacist on the mental health unit. Prescription drug costs, ward stock drug costs, and total number of patient-days on the unit were determined from pharmacy records for the year before and the year immediately after implementation of the position (September 1998 to August 1999 and September 1999 to August 2000, respectively). From these data, the total drug cost per patient-day was calculated and compared for the two 1-year periods. In addition, differences in drug cost per patient-day at 12 months after initiation of the pharmacist position were compared using a matched-pair Student *t*-test.

RESULTS

During the 4-week study period, the pharmacist identified a total of 32 DRPs in 6 patients (Table 1) and

Table 1. Types of Drug-Related Problems (DRPs) Identified by the Pharmacist

DRP	No. (and %) of DRPs*
Adverse drug reaction	12 (38)
Dose too low	6 (19)
Drug not indicated	6 (19)
Incorrect choice of drug	2 (6)
Dose too high	1 (3)
Drug indicated but not prescribed	1 (3)
Other	4 (12)
Total	32 (100)
Actual	26 (81)
Potential	6 (19)

*In 2 cases, 2 categories of DRP were applied to the same problem.

recommended a total of 48 interventions (Table 2). Of the 32 DRPs identified, 26 (81%) were classified as actual and the remaining 6 (19%) as potential. The 3 most common types of DRPs were adverse drug reaction, dose too low, and drug not indicated (Table 1). The 3 most common types of pharmacist-initiated interventions were initiating a drug, discontinuing a drug, and increasing the drug dose (Table 2). The physicians accepted 47 (98%) of the 48 pharmacist-initiated interventions.

Impact of Pharmacist-Initiated Interventions

All DRPs and corresponding interventions were summarized on 27 evaluation forms (in some cases, more than one DRP or more than one intervention per patient was included on a single form). One assessor failed to complete 2 of the forms provided. As a result, only 8 forms (instead of 10) were reviewed in common by all 3 panel members. The coefficient of agreement among the assessors, in terms of interventions having an effect on patient care, was 75%. This indicates reasonably good agreement.

One form that was given to a single assessor, which accounted for 4 interventions, was completed incorrectly, and hence was excluded from the analysis. Therefore, 44 interventions were analyzed. For 38 (86%) of these 44 interventions, the intervention was judged by at least one assessor as having a positive effect on patient care (Table 3). Of the interventions deemed to have a positive effect, 6 were deemed to have a minor effect, 26 a moderate effect, and 6 a marked effect on patient care. Two interventions (5%) were deemed to have no effect, and 4 (9%) were considered to have a potential detrimental effect. Table 4 outlines the assessors' ratings of other patient-related outcomes.

Cost Analysis

Total drug cost per patient-day decreased by 14% in the 12 months after implementation of the pharmacy

Table 2. Types of Interventions Initiated by the Pharmacist

Intervention	No. (and %) of Interventions
Initiated drug	18 (38)
Discontinued drug	12 (25)
Increased dose	6 (12)
Decreased dose	4 (8)
Recommended blood work	3 (6)
Other	5 (10)
Total	48*

*Of the 32 drug-related problems, 8 required 2 interventions each, 1 required 3 interventions, and 2 required 5 interventions each. In 2 cases, 2 categories of DRP were applied to a single problem, each of which was resolved by a single intervention.

Table 3. Impact of 44 Pharmacist-Initiated Interventions, According to 3 Independent Assessors*

Perceived Impact on Patient Care	No. (and %) of Assessments
Positive effect	38 (86)
Minor	6 (14)
Moderate	26 (59)
Marked	6 (14)
No effect	2 (5)
Detrimental effect	4 (9)

*A total of 27 forms were prepared. The panel members evaluated 16, 15, and 14 forms respectively. Eight individual forms were reviewed by all 3 assessors, and the others were reviewed by 1 assessor each. One form (covering 4 interventions) was completed incorrectly by one of the assessors and was excluded from the analysis; as a result, only 44 of the 48 interventions were assessed.

position (Table 5, Figure 1). Relative to the year before initiation of the clinical pharmacist position, the decrease in total drug cost per patient-day in the last 8 months of the year after the position was established was statistically significant (decrease of \$1.39/patient-day [95% confidence interval \$0.71 to \$2.07], $p = 0.0019$). A trend toward statistically significant overall cost savings was observed in a comparison of the year before and the year after implementation of the position ($p = 0.16$).

DISCUSSION

The results of this study confirm that a clinical pharmacist can positively influence patient and economic outcomes in a pediatric mental health population. In our study, 86% of pharmacist-initiated interventions were deemed to have a positive effect on patient care. This is similar to the 87% of positive interventions reported by Bayliff and Einarson,⁸ and the 84% reported by Taylor and others¹⁵ in different settings. The high acceptance rate of the pharmacist's recommendations was encouraging. In similarly



Table 4. Impact of Pharmacists' Interventions on Other Health-Related Outcomes, According to 3 Independent Assessors

Impact	Response; No. (and %) of Interventions		
	Yes	No	Unsure
Increased quality of care	33 (75)	6 (14)	5 (11)
Avoidance of adverse effects	27 (61)	13 (30)	4 (9)
Potential cost savings	16 (36)	17 (39)	11 (25)
Improved response to medication	7 (16)	29 (66)	8 (18)
Improved patient adherence to medication	15 (34)	23 (52)	6 (14)
Decreased hospital length of stay	8 (18)	19 (43)	17 (39)

Table 5. Retrospective Cost Analysis Comparing Drug Expenditures for 1 Year Before and 1 Year After Implementation of Clinical Pharmacy Position

Component	Period; Drug Costs (\$)*		Difference	% Saved
	Before	After		
Ward stock drug costs	2 915.91	2 540.57	375.34	13
Prescription drug costs	23 219.25	18 107.77	5 111.48	22
Total drug costs†	26 135.16	20 648.34	5 486.82	21
Patient days	5 643	5 163	480	NA
Total drug cost per patient-day	4.63	4.00	0.63	14‡

NA = not applicable.

*Except where indicated otherwise.

†Ward stock drug costs + prescription drug costs.

‡*p* = 0.159 (paired-sample *t*-test).

designed studies, acceptance of interventions has ranged from 80% to 96%.^{7,8,15}

Several limitations to this study must be acknowledged. First, there is a possibility of self-reporting bias. However, the number of interventions recorded during the study period was similar to the number recorded during routine workload assessment in the months before the study period. Second, the small number of patients and interventions might limit interpretation of the results. The study was performed in a small hospital unit (17 beds), and the small sample size was compounded by a reduced admission rate during the study period (because of a threatened nurses' strike). A longer study period would have minimized the sample size problem and would also have lessened the impact of seasonal variations in numbers of admissions.

The process for evaluating interventions entails intrinsic bias. Selection bias might have been a factor, as the assessors were not chosen randomly. However, it is believed that the assessors selected were the qualified professionals best able to evaluate the interventions. Although the assessors were given short summaries of the DRPs and interventions, written by the authors, it was often difficult to assess the impact of the interventions without access to the complete medical chart. This might have contributed to the 4 instances in which interventions were assessed as detrimental

(representing 3 actual interventions, since 1 intervention was assessed as detrimental by 2 separate assessors). Although the detrimental assessments are disappointing, and the rate is somewhat higher than those reported in previous studies, it is important that in this study all pharmacist-initiated interventions during the study period were assessed by the panel. This differs from earlier studies, in which only a sample of interventions were selected for assessment. Also, all 3 cases with assessments of detrimental effect had positive outcomes.

Lastly, the retrospective nature of the cost analysis is also a limitation. In this type of analysis it is difficult to determine the extent to which a single factor is responsible for the changes observed. The researchers attempted to control for one factor: number of patient-days. However, other factors, such as changes to the formulary, changes in the physicians who were prescribing medications, or the possibility that patients admitted in the year after implementation of the pharmacy position had milder illnesses and required fewer drugs, might also have influenced drug expenditures. Although it was not possible to determine if the 2 comparison periods differed in terms of patient mix, no significant practice changes occurred during these 2 periods.

The high rate of interventions deemed to have had a positive impact on patient outcomes, coupled with the high acceptance rate of the pharmacist's



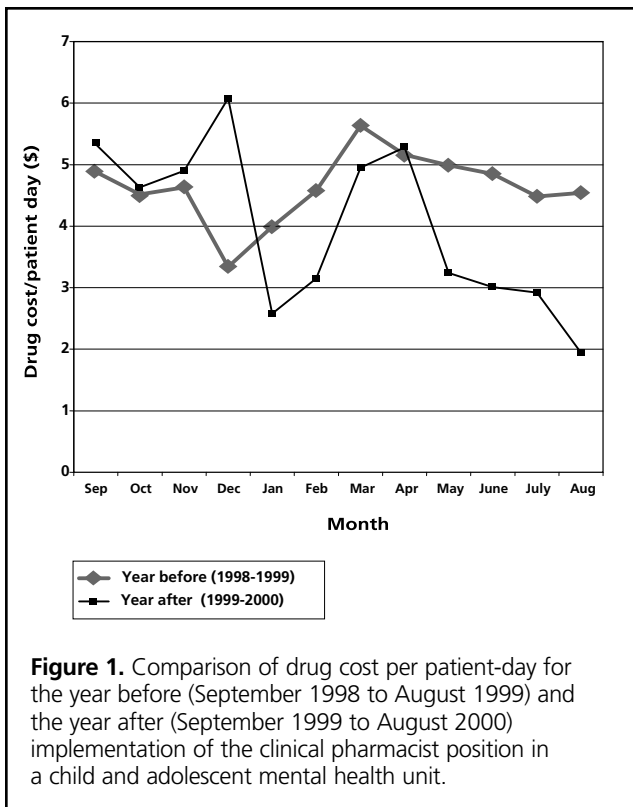


Figure 1. Comparison of drug cost per patient-day for the year before (September 1998 to August 1999) and the year after (September 1999 to August 2000) implementation of the clinical pharmacist position in a child and adolescent mental health unit.

recommendations, indicate that a clinical pharmacist can positively influence patient outcomes in a pediatric mental health population. The cost analysis suggested that the provision of clinical pharmacy services can decrease drug expenditures on this type of unit, at least modestly. The results of this study provide justification for the provision of clinical pharmacy services to patients admitted to a child and adolescent mental health unit.

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