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The effect of delirium education on use of target PRN medications in older orthopaedic patients

SIR—Medications, including anticholinergics [1, 2], neuroleptics and narcotics [3], are recognised as contributing factors to delirium. Often, these medications are prescribed on a PRN (as needed) basis for management of post-operative nausea, delirium and pain. Additionally, antipsychotics and benzodiazepines are the prescribed PRN for delirium symptoms. Delirium complicates the assessment of pain because of the overlapping symptoms and impaired communication, thus resulting in inadequate treatment of pain in delirious older patients [4]. Poor pain control may contribute to worsening cognition and a cycle of ineffective management. The desire to improve delirium management resulted in a geriatric service nurse practitioner and pharmacist from a large Canadian hospital being invited to participate in a one-day session on education for orthopaedic nurses. The purpose of this study is to evaluate one of the outcomes of the educational intervention program: use of PRN medications following repair of hip fracture or elective hip arthroplasty.

Little is known regarding the process of clinical decision-making among nurses with regard to administering PRN medications, although physicians and nurses may have different approaches. In a psychiatric setting, nurses and physicians had disparate views on the use of PRN medications, including the use of antipsychotics and benzodiazepines [5]. Using simulations of analgesics needed in post-operative cancer patients, Di Giulio and Crow reported a non-statistically significant difference in the amount of patient information collected by the two disciplines during assessment [6]. Differences between the medication prescriber (physician) and administrator (nurse) have the potential to adversely affect patient care. There is an absence of evidence that can be used to base the clinical use of PRN psychotropic medication in mental health settings [7], and we suggest that this situation exists with regard to delirious older adults as well. Nurses are called upon to manage complex and overlapping symptoms, pain and delirium, often with little guidance for practice.

The education intervention

Our presentation on delirium was one of several topics covered in the programme on the one-day education session. It was a 1 h lecture, with opportunities for questions and interaction with the audience throughout. Information on incidence, aetiology (including medication-related causes), non-pharmacologic and pharmacologic interventions for delirium were included. Key points of the education included avoiding or minimizing the use of anticholinergics, particularly the routine administration of dimenhydrinate for preventing post-operative nausea. Morphine was recommended in small doses for analgesia in the immediate post-operative period, its dose being progressively tapered down and initiation of acetaminophen around the clock. Use of codeine, acetaminophen/codeine combinations and meperidine was discouraged. Staff were instructed to avoid benzodiazepines, unless the patient was a chronic user preoperatively or on the alcohol withdrawal protocol. Specific antipsychotics were discussed for short-term use in low doses to treat psychotic symptoms of delirium.

Research question

The research question identified was as follows. Following the education session on delirium, did the administration of the target medications (drugs and drug classes addressed in the education session) change in an orthopaedic unit?

Methods

A retrospective review of medication records (medication profiles and administration records) on the hospital's electronic patient record was conducted. Patients aged 65 years and above admitted to the orthopaedic unit for repair of hip fracture or elective hip arthroplasty between 1 January 2003 and 31 December 2003 were included in the sample. This represents the period 6 months prior to and 6 months after the education session. The cases in the sample were identified from the electronic records of unit admissions.

Data collection

Demographic data included the patient's age, gender and reason for admission. Medication profiles and administration records of patients meeting the criteria were examined for the target medications (type of medication, dose and number of doses). Target medications were chosen as they were either on the hospital's care pathway for hip surgery, or had been observed being used in the unit. Doses and number of administrations were recorded and were used to calculate the total oral equivalent (in milligrams) for individual subjects.

Data analysis

Data were analysed using SPSS software. Descriptive statistics were used for demographic data and to describe medication use. Chi-square test was used for nominal data to examine the difference between the number of patients receiving target medications pre- and post-education. For continuous data on total oral equivalent, the independent *t*-test was used for the difference between the means of total dose of target medications pre- and post-education, where subgroups were large and normally distributed. The Mann–Whitney U test was used for small subgroups (less than 30 per group) or where data were skewed.

Ethical considerations

Approval was received from the joint health region/university ethics board. Consent of the individual was not required in this retrospective study; however, the data were limited to diagnosis at admission, age, gender and information on the target medications. Analysis is reported using the aggregate data, and no individual subjects were identified.

Findings

Records of 357 patients meeting the required criteria were included, with 158 in the pre-education group (Group 1) and 199 in the post-education group (Group 2). Mean age of Group 1 was 80.11 years and that of Group 2 was 81.72 years. This difference was not significant. There was a higher percentage of men in Group 1 compared to Group 2, although women were present in sufficient number in both. The majority of patients in both groups underwent hip surgery for a fractured hip (77.2% in Group 1 and 82.9% in Group 2), with planned arthroplasty the second most common reason for surgery (15.2% in Group 1 and 13.6% in group 2). A few patients (7.6% and 3.5%, respectively) were admitted for revision arthroplasty.

Table 1 displays the use of select classes of medication in Group 1 and Group 2. The only statistically significant difference was in the use of the anticholinergic dimenhydrinate. There was a decline in the use of this drug, from 20.9% of patients being administered before the education session to 11.1% after the session ($P = 0.011$). There was also a decline (non-significant) in the use of acetaminophen with codeine 30 mg compound. Use of the other narcotics remained unchanged, which was not unexpected because most patients require narcotics for pain control post-operatively. The number of patients receiving antipsychotics and benzodiazepines increased slightly, although this was not statistically significant.

Mean total dose of the target medications is compared in Table 2. Although fewer patients in Group 2 received dimenhydrinate, the mean dose increased. This was likely due to one patient receiving an unusually high total dose. There was a significant increase in the mean total dose of hydromorphone (149.19 mg in Group 1 vs 209.69 mg in Group 2, $P = 0.044$). There was a non-significant decline in the administration of mean total dose of codeine/acetaminophen compound, morphine and propoxyphene. In patients receiving codeine alone, the mean total dose increased, but this was not significant. Mean total dose of both the common benzodiazepines oxazepam and lorazepam declined post-education, but this change was not statistically significant. There was little change in the mean total dose of the antipsychotic haloperidol (15.46 mg in Group 1 vs 16.46 mg in Group 2, $P = 0.897$). Among the atypical agents, increases in mean total doses of quetiapine and olanzapine were seen; however, the number of patients receiving these agents were too small for meaningful analysis. Decline in the doses of loxapine and risperidone were not significant.

Discussion

This study is limited by its retrospective design. Although the education session was targeted on prevention and management of delirium, we did not have access to all records of the patients to evaluate this. Direct measures of delirium incidence, pain severity or post-operative nausea, all of which would have influenced the nurses' decision to use PRN medications, were not available. Other influences, such as the physician's prescribing practice, which was not examined in this study, informal follow-up or analysis after a 6-month interval rather than at shorter periods, may have affected our results. The difference in the number of subjects in Group 1 and Group 2 may have been due to seasonal variations in injurious falls, physicians being on vacation, and availability of hospital beds for elective surgery. Findings on mean total dose of target medications in groups with small numbers of patients must be cautiously interpreted. The study, however, does suggest a possible effect on the administration of PRN medications by nurses following the one-time education session. There was a decline in the use of some of the agents, such as dimenhydrinate and acetaminophen/codeine compound, which was in keeping with the education session. The overall increase in the use of antipsychotics and benzodiazepine after the education

Table 1. Percentage of patients receiving medications from the target drug groups in Group 1 and Group 2 (pre- and post-educational intervention)

Drug group	% of patients receiving pre-education intervention (Group 1)	% of patients receiving post-education intervention (Group 2)	Chi-square
Anticholinergic (dimenhydrinate)	20.9	11.1	$P = 0.011$[a]
Acetaminophen with codeine 30 mg compound	32.2	24.1	$P = 0.087$
Any narcotic (other than above compound)	93.7	94.5	$P = 0.749$
Any antipsychotic	20.25	23.62	$P = 0.447$
Any benzodiazepine	48.1	52.76	$P = 0.381$

[a]Statistically significant difference.

Table 2. Mean total dose of the target medications

Drug	Group 1 # receiving mean total dose in mg (SD)	Group 2 # receiving mean total dose in mg (SD)	Mann–Whitney U test (unless otherwise indicated)
Dimenhydrinate	$n = 33$	$n = 22$	$P = 0.370$
	87.88	143.2	
	(62.85)	(152.02)	
Codeine and acetaminophen compound	$n = 51$	$n = 48$	$P = 0.836$
	514.12	487.50	*t*-test
	(726.62)	(526.66)	
Morphine	$n = 137$	$n = 177$	$P = 0.552$
	162.76	151.04	*t*-test
	(141.81)	(193.14)	
Hydromorphone	$n = 13$	$n = 16$	$P = 0.044$[a]
	149.19	209.69	
	(369.31)	(572.33)	
Meperidine	$n = 7$	$n = 7$	[b]
	1,312.14	855.71	
	(854.22)	(1,203.7)	
Oxycodone	$n = 6$	$n = 10$	[b]
	122.5	51.25	
	(87.74)	(49.48)	
Codeine alone	$n = 22$	$n = 13$	$P = 0.620$
	481.5	720	
	(495.06)	(789.46)	
Propoxyphene	$n = 20$	$n = 12$	$P = 0.242$
	2499	1150	
	(3,384.74)	(1,288.76)	
Oxazepam	$n = 56$	$n = 81$	$P = 0.262$
	53.21	43.24	*t*-test
	(57.09)	(46.34)	
Lorazepam	$n = 22$	$n = 28$	$P = 0.104$
	5.25	3.21	
	(5.32)	(4.19)	
Haloperidol	$n = 12$	$n = 14$	$P = 0.897$
	15.46	16.46	
	(17.50)	(15.31)	
Loxapine	$n = 11$	$n = 10$	$P = 0.138$
	25	12.85	
	(18.71)	(9.09)	
Quetiapine	$n = 2$	$n = 4$	[b]
	125	487.5	
	(35.36)	(488.83)	
Risperidone	$n = 10$	$n = 18$	$P = 0.598$
	9.18	5.04	
	(14.39)	(4.24)	
Olanzapine	$n = 4$	$n = 11$	[b]
	13	41.59	
	(9.25)	(33.23)	

[a]Statistically significant difference.
[b]One or more groups smaller than $n = 10$, not tested statistically.

session is perplexing. It is possible that more patients were recognised as delirious in Group 2. Anecdotally, we had information that the sedating effect of dimenhydrinate may have previously triggered its administration. In decreasing its use, some nurses may have administered antipsychotics and benzodiazepines more frequently for agitation.

Changing the nursing practice with regard to prevention and management of delirium is complex, and medications are just one component. Large prospective studies that focussed on multiple intervention strategies in older surgical patients have demonstrated positive outcomes [8, 9]. Translational research that focussed on the implementation of evidence-based practice also has made use of multiple interventions [10]. Multifaceted approaches are more likely to be able to address the management of symptoms of complex, overlapping syndromes. Unfortunately, this can be an expensive undertaking, and educators must compete with many other priorities for resources. Considering this,

single-day sessions for inservices and education, covering multiple topics, will likely continue to be strategies used by nurse educators. Our study suggests that changes in practice may occur after a single education session, although any direct cause and effect cannot be drawn. Further prospective research is needed to examine the process of decision making by nurses to administer PRN medications for managing multiple post-operative symptoms in older patients.

Key points

- Education of orthopaedic nurses on delirium management significantly decreased the use of a specific anticholinergic agent in older hip surgery patients during the 6 months after the education intervention.
- At the same time, though the use of analgesic agents did not change, there was a non-significant increase in the use of benzodiazepine.
- Findings from this study suggest that a single education intervention can affect the administration of PRN medications to older post-operative orthopaedic patients by nurses; however, further prospective studies are needed to gain an understanding of the process of clinical decision making by nurses in complex multi-symptom management.

Conflict of interest declaration

There are no conflicts of interest for either author to declare.

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