ORIGINAL RESEARCH

Quantifying Candidacy for Deprescribing of Proton Pump Inhibitors among Long-Term Care Residents

Alanna Doell, Ashley Walus, Jaclyn To, and Allison Bell

ABSTRACT

Background: Proton pump inhibitors (PPIs) are a commonly prescribed drug class used to inhibit gastric acid secretion. They are prescribed for both treatment and prophylaxis of several gastrointestinal conditions. Although PPIs can be used safely in the short term, several serious adverse effects have been reported following long-term use, including increased risk of falls and fragility fractures. Long-term care home (LTCH) residents represent a population in which the long-term adverse effects of PPIs can be significant and PPI deprescribing should be considered when appropriate.

Objectives: To determine the proportion of LTCH residents with PPI prescriptions who were eligible for PPI deprescribing, and to examine vitamin B_{12} deficiencies and fall risk in the study population.

Methods: This cross-sectional, multisite chart review involved LTCH residents who had an active PPI prescription during October 2016. A convenience sample of 150 charts was randomly selected, and the appropriateness of PPI deprescribing was determined using Canadian guidelines. Descriptive statistics were used to examine demographic characteristics, PPI dosing and indication, vitamin B_{12} supplementation, fall history, and fall risk.

Results: Three of the selected charts were excluded because of missing information. Of the 147 residents included in the chart review, 93 (63%) were candidates for deprescribing. PPI use for gastroesophageal reflux disease for more than 8 weeks without a deprescribing attempt in the past year was the most frequently observed opportunity for deprescribing (49/93 [53%]). Twenty-nine residents (20%) had no documented indication for PPI use. Thirteen residents (9%) had had a fall within the past 30 days, and 53 (36%) had a prescription for vitamin B_{12} supplements and/or had low serum vitamin B_{12} levels.

Conclusions: A majority of the residents whose charts were reviewed were candidates for PPI deprescribing. This finding suggests an opportunity for clinicians who care for LTCH residents to increase their deprescribing efforts.

Keywords: proton pump inhibitors, elderly patients, deprescribing, long-term care

RÉSUMÉ

Contexte : Les inhibiteurs de la pompe à protons (IPP) sont des médicaments couramment prescrits pour inhiber la sécrétion d'acide gastrique. Ils sont prescrits comme traitement et comme prophylaxie pour plusieurs troubles gastro-intestinaux. Bien que les IPP puissent être utilisés de façon sécuritaire à court terme, plusieurs effets indésirables graves ont été signalés à la suite d'une utilisation à long terme, notamment une augmentation des risques de chutes et de fractures de fragilité. Les résidents de centres d'hébergement et de soins de longue durée (CHSLD) représentent une population chez qui les effets indésirables d'un traitement à long terme par IPP peuvent être significatifs et la déprescription des IPP doit être envisagée lorsque cela est approprié.

Objectifs : Déterminer la proportion de résidents de CHSLD ayant une ordonnance d'IPP qui satisfaisaient aux conditions requises pour une déprescription des IPP. De plus, examiner au sein de la population à l'étude les carences en vitamine B_{12} et les risques de chutes.

Méthodes : La présente étude transversale menée dans plusieurs centres comportait une analyse des dossiers médicaux de résidents de CHSLD qui avaient une ordonnance active d'IPP en octobre 2016. Un échantillon de commodité de 150 dossiers médicaux a été choisi au hasard et la pertinence d'une déprescription des IPP a été déterminée à l'aide des lignes directrices canadiennes. Des statistiques descriptives ont été employées pour analyser les caractéristiques démographiques, les posologies et les indications des IPP, la prise de suppléments de vitamine B12, les antécédents de chute et les risques de chute.

Résultats : Trois des dossiers sélectionnés ont été exclus parce qu'il y manquait des renseignements. Des 147 résidents dont les dossiers ont été analysés, 93 (63 %) satisfaisaient aux conditions requises pour une déprescription. L'emploi d'IPP pour traiter le reflux gastro-œsophagien pendant plus de huit semaines sans qu'il y ait eu de tentative de déprescription dans la dernière année représentait l'occasion la plus fréquemment observée pour procéder à une déprescription (49/93 ou 53 %). Vingt-neuf résidents (20 %) utilisaient des IPP sans qu'une indication apparaisse aux dossiers. Treize résidents (9 %) avaient subi une chute au cours des 30 derniers jours et 53 (36 %) avaient une prescription pour des suppléments de vitamine B_{12} ou affichaient des taux sériques faibles de vitamine B_{12}.

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Conclusions : La majorité des résidents dont les dossiers ont été examinés remplissaient les conditions requises pour une déprescription des IPP. Ce résultat suggère qu'il y a là une occasion pour les cliniciens qui prennent soin de résidents de CHSLD d'accroître leur travail de déprescription.

Mots clés : inhibiteurs de la pompe à protons, patients âgés, déprescription, soins de longue durée

INTRODUCTION

With US$26 billion spent worldwide in 2011, proton pump inhibitors (PPIs) are one of the most commonly prescribed classes of drugs.[1] PPIs prevent basal and stimulated gastric acid secretion from the parietal mucosa cells of the stomach by inhibiting the hydrogen potassium pump, which results in highly effective acid suppression. These agents are used to treat and prevent several disease states in which gastric acid suppression is required. They are usually indicated for short-term use (less than 8 weeks). PPIs have become widely used because of their efficacy, low cost, and acceptable adverse effect profile.

Although PPIs can be used safely in the short term, several serious adverse effects associated with long-term use have been described in the literature, including increased fracture risk, reduced absorption of some medications and nutrients (including vitamin B_{12}), pneumonia, *Clostridium difficile* infections, and death.[2-7] Several epidemiological studies and meta-analyses have described a modest, dose-dependent association between long-term PPI use and increased incidence of hip, vertebral, and all-type fractures.[8-15] Despite the association with fracture risk, there has been a lack of evidence demonstrating radiological changes in bone mineral density among PPI users.[16-19] However, long-term PPI use may be associated with an increased incidence of falls and resulting fracture, secondary to paresthesia caused by vitamin B_{12} deficiency.[20]

The incidence of PPI use without documented indication is estimated at about 50% and has been described as occurring among both inpatients and outpatients.[21-23] Overprescribing of PPIs also extends to long-term care homes (LTCHs), although the literature for this setting is much more limited.[24,25] Given the accumulating literature regarding serious adverse effects with prolonged use, the evidence appears to support regular re-evaluation of PPI therapy after an appropriate length of treatment.

Deprescribing is defined as the process by which drugs whose harm may outweigh their benefits in individual patients are identified and subsequently discontinued.[26] Deprescribing is especially important for elderly patients because this population is at higher risk of drug-related adverse effects and associated morbidity, mortality, and health care utilization.[27] Choosing Wisely Canada has created a toolkit for PPI deprescribing, which includes an algorithm and guideline to aid clinicians in making evidence-informed decisions regarding PPI discontinuation.[28] This algorithm clearly delineates a process for identifying patients who are suitable candidates for PPI deprescribing, options for deprescribing, and recommendations for monitoring and follow-up.

Despite the recent focus in the literature, it is unclear whether PPI deprescribing is being practised consistently for long-term care residents in Winnipeg. The primary objective of this study was to determine the proportion of PPI users in a group of LTCHs who were candidates for deprescribing, according to documented indications, duration of therapy, and past deprescribing attempts. The secondary objectives were to evaluate fall rates and factors relating to vitamin B_{12} deficiency, to determine whether any patterns could be identified among PPI users.

METHODS

A cross-sectional, multisite, chart review was conducted in 5 LTCHs in Winnipeg, Manitoba. Residents of the LTCHs were included if they were over the age of 65 years, had a prescription for a PPI at the time of the chart review, and had undergone at least 1 interdisciplinary quarterly medication review (QMR) since the PPI was initiated. Residents were excluded if they had resided in the LTCH for less than 6 months or they had died or been transferred to a different facility between the time when the pharmacy list was generated for the study and actual data collection.

A convenience sample of 150 health records from the 5 LTCHs with the largest volumes of PPI use was generated using reports from the pharmacy information system, which identified residents with an active PPI prescription during the month of October 2016. For each of the 5 participating sites, the list of residents taking PPIs was randomized using a random number generator, and the health records of 30 residents meeting the inclusion criteria were selected for review from this randomized list. Data were collected by a single investigator (A.D.); a second investigator (A.B.) independently validated the data collected from the first 5 health records at each facility.

Data are presented in aggregate using descriptive statistics. Descriptive parameters, including frequencies, medians, and ranges, were calculated using an Excel spreadsheet (Microsoft Inc, Redmond, Washington). This research was conducted in accordance with the ethical standards of the Helsinki Declaration. The data were collected as a non-interventional quality assurance audit; therefore, the Government of Canada's Interagency

Advisory Panel on Research Ethics involving humans exempts this project from ethics approval by the University of Manitoba's Bannatyne Campus Health Research Ethics Board. The project was reviewed by the Pharmacy Quality Council of the Winnipeg Regional Health Authority, which waived the need for informed consent.

Data were collected for the following characteristics of LTCH residents: age, sex, length of stay in current LTCH, number of QMRs since the resident started PPI therapy, and total number of prescribed medications. Concurrent medications associated with PPI use were recorded, including nonsteroidal anti-inflammatory drugs (NSAIDs), antiplatelet agents, glucocorticoids, and anticoagulants.

To assess the primary objective, the PPI agent, dosing regimen, and indication from the most recent QMR were recorded. The algorithm in the Choosing Wisely Canada toolkit was used to assess PPI appropriateness and eligibility for deprescribing.[28] Residents with any of the following characteristics were not considered to be candidates for deprescribing: concurrent NSAID therapy and moderate to high risk for gastroduodenal injury; dual antiplatelet therapy; history of gastrointestinal ulcer, esophagitis, or Barrett esophagus; *Helicobacter pylori* eradication therapy administered for less than 14 days; or a failed deprescribing attempt in the past year. All documented gastrointestinal ulcers were presumed to be bleeding ulcers. Risk of gastrotoxicity in residents taking NSAIDs was determined with the American College of Cardiology Foundation Task Force consensus documents.[29] Candidates for deprescribing included those with no documented indication for PPI use, those receiving a PPI for gastroesophageal reflux disease (GERD) for longer than 8 weeks, those with twice-daily dosing for any indication other than *H. pylori* eradication, and those with inappropriate indications for PPI use. Residents whose only risk factor for gastrotoxicity was long-term use of low-dose acetylsalicylic acid (ASA) were considered candidates for deprescribing because of a lack of convincing evidence that PPIs confer benefit for this population.[30]

To assess the secondary objectives, the most recent serum vitamin B_{12} level was recorded. Levels were recorded as low (less than 220 pmol/mL), normal to high (greater than or equal to 220 pmol/mL), or not measured within the past 12 months. Fall risk was recorded as low, medium, or high, based on the most recent assessment of fall risk. Four of the LTCHs used the Fracture Risk Assessment Tool (FRAT),[31] whereas the fifth LTCH used the Morse Fall Scale.[32] History of a fall within the past 30 days was determined from LTCH incident records and progress notes in the residents' charts.

RESULTS

Of the 150 charts selected, 3 were omitted from analysis because information necessary to complete the review was missing; therefore, a total of 147 charts were analyzed. The study population had a mean age of 87 years, and most of the residents (113 [77%]) were women; other baseline characteristics are presented in Table 1. Pantoprazole was the most commonly used PPI (96 residents [65%]) because of institutional automatic substitution policies (Table 2). Most of the residents (118 [80%]) had been taking a PPI for longer than 1 year since admission. Of note, only 99 (67%) of the residents had been taking a PPI at the time of admission to the LTCH. The most common indication was GERD (79 [54%]); 29 residents (20%) had no documented indication for PPI therapy.

Candidacy for deprescribing is detailed in Table 3. Overall, 93 residents (63%) were potential candidates for deprescribing. Extended duration of PPI therapy (longer than 8 weeks) during treatment for GERD was the most frequently observed opportunity for deprescribing (49/93 [53%]). Pharmacists in the LTCHs had noted deprescribing opportunities on the QMR forms of 13 residents (9%). However, in each of these cases, the PPI had not been discontinued. For an additional 14 residents (10%), the PPI dose had been successfully reduced since admission to the LTCH.

More than half of the study population was considered to be at high risk for falls (Table 4). For 70 residents (48%), vitamin B_{12} had not been measured in the past year (Table 4). Fifty-three residents (36%) were receiving oral or intramuscular vitamin B_{12} supplementation and/or had low serum vitamin B_{12} levels.

DISCUSSION

This chart review showed that the majority of residents in the study population were candidates for PPI deprescribing. Current provincial standards dictate that long-term care residents undergo interprofessional medication reviews every 3 months. These QMRs involve the systematic evaluation of each resident's medication therapy and are attended by the prescriber, a pharmacist, and a nurse. If the QMRs are conducted in accordance with national guidelines, all residents who are taking a PPI would have an appropriate and documented indication for the drug. However, despite the opportunity to evaluate PPI appropriateness during QMRs, the current study suggests that this may not be done routinely for every resident.

Table 1. Characteristics of the Study Population

Characteristic	No. (%) of Patients* (*n* = 147)
Age (years), median (range)	87 (66–102)
Length of stay in LTCH (months), median (range)	30 (6–132)
Sex	
Men	34 (23)
Women	113 (77)
No. of medications, median (range)	12 (5–26)
Prescription for PPI on admission to LTCH	
Yes	99 (67)
No	48 (33)

LTCH = long-term care home, PPI = proton pump inhibitor.
*Except where indicated otherwise.

Table 2. Characteristics of PPI Use

Characteristic	No. (%) of Residents (*n* = 147)
PPI medication	
Pantoprazole	96 (65)
Omeprazole	48 (33)
Esomeprazole	2 (1)
Rabeprazole	1 (1)
Lansoprazole	0 (0)
Duration of PPI therapy since admission	
< 1 month	1 (1)
1 to 3 months	3 (2)
3 months to 1 year	25 (17)
1 to 3 years	75 (51)
> 3 years	43 (29)
PPI dosing schedule	
Daily	129 (88)
Twice daily	15 (10)
Three times per week	3 (2)
Documented indications	
Appropriate	
GERD	79 (54)
Peptic ulcer disease (active or history)	28 (19)
Long-term NSAID use with risk of bleeding	10 (7)
Inappropriate	
Corticosteroid use	2 (1)
Low-dose ASA use (81 mg)	10 (7)
Aggressive behaviour	1 (1)
No indication	29 (20)

ASA = acetylsalicylic acid, GERD = gastroesophageal reflux disease; NSAID = nonsteroidal anti-inflammatory drug, PPI = proton pump inhibitor.

Table 3. Evaluation of PPI Deprescribing Appropriateness

Variable	No. (%) of Residents (*n* = 147)
Candidate for deprescribing	
No	54 (37)
Yes	93 (63)
Reason for noncandidacy	*n* = 54
NSAID use	14 (26)
History of ulcer	30 (56)
Unsuccessful deprescribing attempt in past year	5 (9)
Dual antiplatelet therapy	5 (9)
Reasons for candidacy	*n* = 93
Twice daily dosing for indication other than *Helicobacter pylori* eradication	15 (16)
GERD treatment for > 8 weeks	49 (53)
Inappropriate indication	12 (13)
No documented indication	29 (31)

GERD = gastroesophageal reflux disease, NSAID = nonsteroidal anti-inflammatory drug, PPI = proton pump inhibitor.

Table 4. Fall Risk and Vitamin B_{12} Status

Characteristic	No. (%) of Residents (*n* = 147)
Fall risk	
Low	30 (20)
Medium	38 (26)
High	79 (54)
Vitamin B_{12} supplementation	
Intramuscular	7 (5)
Oral	43 (29)
None	97 (66)
Vitamin B_{12} level (within the past year)	
Low (< 220 pg/mL)	9 (6)
Normal or high (≥ 220 pg/mL)	68 (46)
Not measured	70 (48)
History of a fall in past 30 days	
Yes	13 (9)
No	134 (91)

These results are consistent with other studies that have considered PPI appropriateness in LTCHs. In a chart review conducted in Pennsylvania, 61% of patients transferred from hospital to an LTCH were taking a PPI.[24] The authors defined appropriate diagnoses as GERD, upper gastrointestinal bleeding, peptic ulcer disease, or empiric treatment of "heme-occult positive stool", but did not include ulcer prophylaxis with NSAID use. Using this list, they determined that PPIs had been prescribed with an appropriate diagnosis for only 50% of PPI users. A large-scale review of PPI use across LTCHs in 22 US states found that 24% of patients were taking PPIs without an appropriate indication, and 47% had no documented indication.[25] The authors of that review may have observed a lower rate of inappropriate use because they defined a wider range of indications as appropriate compared with other studies.

When deprescribing is considered, it is important to know relevant past medical conditions and medication indications. Documentation is important in this context, because the Choosing Wisely PPI deprescribing tool considers PPI therapy without a documented indication as a reason for deprescribing candidacy.[28] This chart review found incomplete documentation of past medical history and medication indications in the medical records at the LTCHs, in particular, limited documentation of medical conditions such as esophagitis or bleeding ulcers that could justify long-term PPI use. Without documented evidence to rule out these conditions as indications for PPI use, clinicians may be more hesitant to consider deprescribing. One of every 5 residents in the study population did not have a documented indication for PPI use, a rate much lower than what has been reported in other studies (about 50% of cases of PPI use without a documented indication[21-23]). This finding may be explained by the QMRs, which provide an ideal setting and opportunity for updating medical records and documenting indications for drug therapy appropriately.

The chart review identified opportunities for clinicians to reassess long-term PPI use for the treatment of GERD. Treatment for GERD for longer than 8 weeks without deprescribing attempts in the past year accounted for 53% of identified deprescribing candidates. Evidence suggests that among individuals using PPIs for GERD, decreasing the dose does not increase

the risk of symptom return, and 90% of individuals who discontinue the PPI and use it on demand will not have return of symptoms.[28] These data suggest that these are both reasonable strategies that could be used for residents who are being treated for GERD on a long-term basis. For residents with cognitive impairment, it might be difficult to implement and monitor on-demand use; therefore, this approach needs to be evaluated on a case-by-case basis.

Inappropriate documented indications in this chart review included concurrent use of low-dose ASA or a corticosteroid. There is unconvincing evidence that either of these medications require concomitant PPI therapy in the absence of other risk factors for gastrointestinal toxicity.[30] The chart review also identified a single resident for whom the documented indication for PPI use was aggressive behaviour. The authors are unaware of any literature to support this indication.

Forty-eight residents (33%) were not receiving a PPI at the time of admission to the LTCH. In this subgroup, the PPI had to have been started by the LTCH clinician or during a hospital stay occurring after transition to the LTCH. One opportunity for future study involves determining how many residents had PPIs started during a hospital stay and whether the appropriateness of PPI therapy was evaluated upon return to the LTCH.

The chart review identified residents with active PPI therapy during the study period; therefore, capturing the number of residents whose PPI was appropriately discontinued upon admission or during a previous QMR was beyond the scope of the study. However, this study did provide some insight on deprescribing efforts by pharmacists. As documented in the QMR records, pharmacists identified 13 residents who were potential candidates for deprescribing, but the reasons for not attempting deprescribing were not documented. Possible influencing factors include prescriber attitudes and beliefs, family or caregiver resistance, and discussion of reasons for noncandidacy that were not documented in QMR records. Further research is needed to identify barriers to deprescribing in this population and to design strategies that target those barriers with a goal of increasing deprescribing efforts.

The chart review found that 9% of residents had experienced a fall within the past 30 days. The Canadian Institute for Health Information has reported fall rates within the past 30 days of 19% for LTCHs in Winnipeg and 15.7% for LTCHs in all of Canada.[33] The lower incidence of falls in the current study population does not support the theory that an increase in fractures among PPI users occurs secondary to increased falls. However, because of inconsistencies in reporting falls across sites, the fall rate identified in the current chart review may not reflect the true incidence of falls in these 5 facilities. More than half of the residents were considered to have a high risk of falls; however, fall risk data for Winnipeg LTCHs are not available, and a comparison cannot be made with residents who did not have a PPI prescription.

This chart review also examined the rate of vitamin B_{12} deficiency and whether vitamin B_{12} deficiency was more prevalent among PPI users. Nine residents (6%) had a low serum vitamin B_{12} level. Unfortunately, 48% of the study sample had not had vitamin B_{12} serum level measured within the past 12 months, which made it difficult to comment on the prevalence of vitamin B_{12} deficiency for the study population as a whole; however, one-third of the study group was receiving exogenous vitamin B_{12}, which may be an indicator of the rate of deficiency.

Collecting data from 5 sites with multiple prescribers helped to capture a broad understanding of patterns of PPI use in Winnipeg LTCHs. QMRs were used for all residents and were of identical format across sites, which allowed for complete and uniform data collection. Medical records were easy to access, and records starting from admission were available, which allowed assessment of changes in therapy from the time of admission until data collection for this study. The authors were able to use Canadian and age-specific guidelines to determine PPI deprescribing candidacy. Use of the pharmacy information system to identify residents receiving a PPI resulted in all PPI users being randomized, which helped to ensure that the study sample accurately represented the population.

This chart review had a few limitations. Factors for not pursuing deprescribing that were unrelated to indication, such as resident or caregiver resistance to changing medications, could not be determined from the documentation available in the medical record. In addition, documentation of prior gastrointestinal bleeding or peptic ulcer disease was often missing or inconsistent among the 5 sites. Without verbal confirmation of medical history from the resident or caregiver, it is possible that the study overlooked residents with an undocumented history of gastrointestinal bleeding or peptic ulcer disease. There was also poor documentation of the reasons why PPI deprescribing attempts had failed. Another limitation was that the indication for each medication was not explicitly stated in the QMRs; as such, the indication for PPI therapy had to be inferred from concurrent medical conditions and medications listed on the QMR form. This situation leaves room for misinterpretation by the data collector.

CONCLUSION

In this chart review, the majority of LTCH residents in the study population were candidates for PPI deprescribing, which indicates opportunities for education and engagement of prescribers, pharmacists, nurses, residents, and family members. Long-term use of PPIs is associated with important adverse effects, and therapy must therefore be carefully re-evaluated at regular intervals. Clinicians should consider deprescribing, when appropriate, according to patient-specific factors. Further research is needed to evaluate strategies to encourage PPI deprescribing practice among clinicians.

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