Evaluation of a Pharmacist-Led Proton Pump Inhibitor Deprescribing Process in an Acute Care Hospital

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ABSTRACT

Rationale:
The long term use of proton pump inhibitors (PPIs) has been associated with an increased risk of morbidity. The ongoing need for PPIs is often not reassessed in a timely fashion. The transition of care between the community and the hospital may present a suitable opportunity for the review of a patient’s medications, and hospital pharmacists have the potential to instigate the deprescribing process.

Objectives:
To determine the effectiveness and feasibility of the implementation of a systematic pharmacist-led PPI deprescribing process in an acute care setting.

Methods:
A prospective before and after study was conducted in patients newly admitted to the Internal Medicine service with a PPI as a part of their home medication regimen. The pre-intervention phase consisted of usual care, followed by the intervention phase where a pharmacist-led PPI deprescribing process was implemented. The PPI deprescribing tool created through the “Deprescribing Guidelines for the Elderly Project” was used to aid in the deprescribing process.

Results:
There was no statistically significant difference in the percentage of PPIs deprescribed on discharge between the pre-intervention and intervention phases (6.4% vs. 14.3%, p=0.373). In the intervention phase, 21 patients receiving a PPI prior to admission were assessed for appropriateness of deprescribing by the investigator. Deprescribing was appropriate for seven patients, of which six were agreeable to a deprescribing trial. Deprescribing was suggested to the physician by the clinical pharmacist for three patients, all of which were agreed to by the
physician. At discharge, one patient’s PPI was deprescribed. The average time used by the investigator to determine the PPI indication and assess for appropriateness was nine minutes.

**Conclusion:**

The implementation of a pharmacist-led PPI deprescribing process in an acute care setting did not significantly impact deprescribing rates.

**Keywords:** deprescribing, proton pump inhibitors, inappropriate prescribing, pharmacists, hospitals

**Abstract Word Count:** 286

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Introduction

Background

Polypharmacy, the use of more drugs than clinically necessary, is a rising trend in Ontario, where a 165% increase of public program prescription claims per person has been observed over 10 years.\textsuperscript{1,3} The number of medications taken by an elderly person is positively correlated with poor outcomes, including adverse drug events, drug interactions, functional and cognitive impairments, falls, and hospitalizations.\textsuperscript{2} Deprescribing is the process of stopping or tapering medications with the aim of improving patient outcomes.\textsuperscript{3} Focused guidelines have been developed by the Canadian Deprescribing Network to aid clinicians in deprescribing priority medication classes, including proton pump inhibitors (PPIs).\textsuperscript{4}

PPIs are the second most prevalent drug class reimbursed by the Ontario Drug Benefit program.\textsuperscript{5} They are commonly initiated, but are often not reassessed in a timely fashion. The long term use of PPIs has been associated with an increased risk of fractures, pneumonia, hypomagnesemia, enteric infections, vitamin B12 deficiency, dementia, acute interstitial nephritis, and chronic kidney disease.\textsuperscript{6} Though previously perceived to be a benign drug class, PPIs present potentially significant risks that warrant ongoing reassessment of their appropriateness.

Rationale

The purpose of this study was to evaluate the implementation of a pharmacist-led PPI deprescribing process in an acute care setting. Pharmacist involvement in deprescribing has been shown to significantly reduce polypharmacy.\textsuperscript{7} The transition of care between the community and the hospital presents an opportunity for hospital pharmacists to initiate the deprescribing process.
Recent studies on pharmacist-led PPI deprescribing were conducted in non-acute care settings, such as hospital outpatient clinics, long term care facilities, and family health team centres.\textsuperscript{8,9,10} One study evaluated PPI deprescribing in an acute care hospital by medical residents.\textsuperscript{11} To date, there have been no studies evaluating the role of the pharmacist in PPI deprescribing in an acute care setting.

At Kingston Health Sciences Centre (KHSC), there is a lack of a standardized process to guide deprescribing initiatives by clinical pharmacists. The systematic implementation of a standardized PPI deprescribing tool applied at the time of initial patient assessment can potentially increase the percentage of PPIs deprescribed on discharge compared to usual care.

\textit{Study Objectives}

The primary objective of this study was to determine the effectiveness of a systematically implemented, pharmacist-led PPI deprescribing process. This was quantified through measurement of the difference in the percentage of PPIs deprescribed (discontinuation, dose or frequency reduction) at discharge between the pre-intervention and intervention phase.

The secondary objective of this study was to evaluate the feasibility of this deprescribing initiative. The time utilized in the application of the deprescribing tool was gathered to provide an estimate of the impact of this intervention on the workload of a clinical pharmacist.
Methods

Study Design and Patient Population

The study was conducted as a prospective, uncontrolled, before and after study at the KHSC from March 4\textsuperscript{th} to March 31\textsuperscript{st}, 2017. A two week pre-intervention phase consisting of usual care was immediately followed by a two week intervention phase, during which a PPI deprescribing process was systematically implemented. Newly admitted patients to the Internal Medicine Units (IMU) A, B, C, and D, with a Best Possible Medication History completed by Pharmacy Services, using a PPI prior to admission, were included in the study.

Patients were excluded if they were palliative on admission or termed palliative during the hospital stay; transferred to a non-medicine, short stay medicine, or long stay medicine service; admitted for a suspected gastrointestinal bleed; discharged and subsequently readmitted to the IMU A, B, C, or D services during the study period; unable to provide satisfactory history or agreement for investigator to make deprescribing suggestion; and/or not discharged before the follow up date of May 14\textsuperscript{th} 2017.

Deprescribing Tool Implementation

The Canadian Deprescribing Network’s PPI deprescribing algorithm was applied by the investigator to eligible patients in the intervention phase to assess for the appropriateness of PPI deprescribing.\textsuperscript{12} When deprescribing was deemed appropriate, the patient and/or family/caregiver were consulted for agreeability before a recommendation was made. The investigator communicated a deprescribing recommendation to the clinical pharmacist via an electronic note on the patient roster in the Pharmacy Information System (PIS). The clinical pharmacist communicated the recommendation to the care team, either verbally or by a written “pharmacist suggests” order, if in agreement with the recommendation.
Data Collection

The following baseline characteristics were collected on all eligible patients in the study: age, sex, number of home medications, and discharge diagnosis. Patient records were maintained by assigning a participant number to each patient to facilitate follow up without using patient identifiers in all documents.

To assess for successful deprescribing, patient discharge summaries were reviewed on the Patient Care System (PCS). Patient charts were reviewed to identify “pharmacist suggests” orders or progress notes indicating that a recommendation had been made by the clinical pharmacist to the prescriber. To determine whether the prescriber accepted the pharmacist’s recommendation, the patient chart was reviewed for co-signed “pharmacist suggests” orders, verbal orders from the prescriber recorded by the clinical pharmacist, and progress notes documenting a recommendation.

The total time spent by the investigator for each patient on identifying and verifying the PPI indication and assessment of eligibility to trial PPI deprescribing was recorded.

Data Analysis

A two tailed independent t-test was performed to assess for any differences between the pre-intervention and intervention groups for age and number of home medications. A two tailed independent chi-squared test was performed to determine any difference between the sexes of the two groups.

A two tailed independent t-test was performed to determine the statistical significance of the primary outcome of the percentage of PPIs deprescribed before and after the systematic, pharmacist-led implementation of the deprescribing tool.
A p value of <0.05 was considered to be significant for all statistical tests. Secondary outcomes were reported using descriptive statistics.

Ethics

Approval by the Research Ethics Board at Queen’s University was obtained via an expedited ethics review prior to data collection.
Results

Study Participants

In the pre-intervention phase, 59 patients met the initial inclusion criteria and 45 patients were eligible for data analysis (Figure 1). Of note, among the 14 excluded patients, four were excluded due to transferral to another service and five were excluded due to death during their hospital stay.

In the intervention phase, 41 patients met the inclusion criteria and 21 patients were eligible for data analysis (Figure 2). Among the 20 excluded patients, seven were excluded due to a previous admission and six were excluded due to a suspected gastrointestinal bleed.

There were no statistically significant differences between recorded baseline characteristics of the pre-intervention and intervention groups (Table 1). The average age of the patients in the pre-intervention phase was 73 years, and in the intervention phase was 76 years. Approximately half of the patients in each group were male. Patients in the pre-intervention and intervention groups were receiving an average of 14 medications and 13 medications prior to admission, respectively.

Figure 3 summarizes the indications for PPI therapy among the intervention phase patients.

Deprescribing Process

The process of pharmacist-led deprescribing in the intervention phase is summarized in Figure 4. Thirty-three percent of patients assessed by the investigator were deemed to be suitable for a deprescribing trial of their PPI. The majority of these patients (86%) were agreeable to the investigator’s deprescribing recommendation. However, only half of the recommendations put forth by the investigator were addressed by the clinical pharmacist. All pharmacist
recommendations were accepted by the physician. However, only one out of the three accepted recommendations was maintained at discharge.

Primary Outcome

There was no statistically significant difference in the percentages of PPIs deprescribed between the pre-intervention and intervention groups (6.4% vs 14.3% respectively). Of the three PPIs deprescribed in the intervention phase, only one was the result of the systematic implementation of a pharmacist-led deprescribing process. Two of the three PPIs deprescribed in the intervention phase were a result of usual practice independent of the systematic process implemented.

Secondary Outcome

An average of nine minutes was used by the investigator to employ the deprescribing tool for assessment of the appropriateness of PPI deprescribing (Figure 3).
Discussion

There were more patients in the pre-intervention phase who were eligible for analysis despite similar hospital admission rates during each phase (Figure 1, Figure 2). Fifty-nine patients in the pre-intervention group and 41 patients in the intervention group met the initial inclusion criteria. There was a smaller percentage of patients excluded in the pre-intervention group (24%) compared to the intervention group (49%). This difference was largely driven by a greater number of patients in the intervention group excluded for a suspected gastrointestinal bleed or a previous admission during the study period.

The baseline characteristics were similar among the two groups, with the average age of patients being 74 years, and the average number of 14 home medications per patient (Table 1). Given the elevated risk of drug related adverse effects with increased patient age and number of medications, this population, typical of an inpatient general internal medicine population, represents a group for whom a trial of deprescribing initiatives would be appropriate.\(^\text{13}\)

Indications for PPI use among patients in the intervention phase are shown in Figure 3. In patients for whom deprescribing was appropriate, the most common category was “Unknown”. The deprescribing algorithm used in the study operates under the assumption that a deprescribing trial would be appropriate if there was no identifiable reason for a patient to be using a PPI. In our study, multiple methods were applied to determine the indication; this included a patient and/or family/caregiver interview, current hospital admission notes, past hospital admission or discharge notes, and past clinic notes. In patients for whom deprescribing was deemed to be inappropriate, the majority of patients were either using a PPI for severe reflux symptoms, or “Other” reason not specified by the deprescribing algorithm used. Severe reflux symptoms were operationally defined as ongoing symptoms that interfere with daily activity, persistent for
greater than six months, nocturnal, or greater than three or more times per week. Of the five patients categorized as “Other”, two patients had previously trialled tapering or stopping their PPIs unsuccessfully. Both patients had severe symptoms that were refractory to other pharmacologic therapies, namely histamine-2 receptor antagonists and antacids. In patients categorized as “Other”, professional judgment was exercised by the investigator independent from the algorithm.

There was no statistically significant difference in the percentage of PPIs deprescribed at discharge between the pre-intervention and intervention groups (Table 2). Additionally, only one of the three PPIs deprescribed at discharge in the intervention group resulted from the systematic implementation of a pharmacist-led deprescribing process. The remaining two PPIs were deprescribed during routine evaluation of acute care issues by the care team and were independent of the intervention. Results suggest that the implementation of a systematic, pharmacist-led PPI deprescribing process did not have a significant impact on the percentage of PPIs deprescribed at discharge.

Figure 4 presents several barriers against the implementation of a pharmacist-led deprescribing process. Barriers that have been cited in previous studies on PPI deprescribing include difficulty in assessing full medication histories, physician discomfort with deprescribing, patient unwillingness to deprescribe, and time constraints. In this study, the indication for a PPI was unknown for only two out of 21 patients, and the deprescribing algorithm used allowed for deprescribing to be trialled even with an unknown indication. Physician discomfort and patient unwillingness to deprescribe were not observed in this study. Time constraints potentially affected the number of investigator recommendations addressed by the clinical pharmacist, as a patient’s more acute clinical issues may have been prioritized over efforts to deprescribe.
Clinical pharmacists are often assigned to multiple inpatient services and this may have also influenced the number of recommendations addressed, especially if the clinical pharmacist was not as familiar with the patient or the care team.

One significant barrier to deprescribing in this study was the low rate of PPIs deprescribed in hospital that were maintained at discharge. In all three instances, progress notes summarizing the rationale of the recommendation were documented in the patient chart. The PPIs were restarted as per home regimen by the discharging physician based on the admission medication reconciliation. The discharging physician was likely unaware of the intentional deprescribing of the patient’s PPI. This observation suggests a potential need for methods of communication between the pharmacists and discharging physicians beyond the standard documentation in the paper chart, to ensure that pharmacist interventions in hospital are carried forth at discharge.

The average time used by the investigator to determine the PPI indication and assess for deprescribing appropriateness was nine minutes. This time was likely not an accurate reflection of the additional time taken by a clinical pharmacist to assess for PPI deprescribing in practice. Given the usual familiarity of the clinical pharmacist with the patient’s past medical history, the assessment for deprescribing would likely not necessitate as much additional time to determine the indication. In addition, the time required for implementation of a pharmacist recommendation to deprescribe a PPI was not measured in this study.

This study was limited by a short duration of four weeks. The study was conducted during a four week period where the medical residents remained consistent. However, the attending physicians rotated at the midpoint of the study, such that there were different physicians in the pre-intervention and intervention periods. The attending physicians’ attitudes
towards deprescribing may have influenced the rate of deprescribing at baseline, as well as the willingness to accept pharmacist-led deprescribing recommendations. This source of bias may have been reduced if the study took place over a longer period, allowing attending physicians to complete a full rotation schedule.

Another limitation of the study was the lack of follow up post discharge to assess for the long term success of PPIs deprescribed. As well, the medicine pharmacists were aware of the deprescribing project and its study period. This awareness may have influenced usual practice of the pharmacists towards deprescribing during the pre-intervention and intervention phases.

Conclusion

The implementation of a systematic pharmacist-led PPI deprescribing process in an acute care setting did not have a significant impact on deprescribing rates at discharge. Enhanced pharmacist involvement in patient discharge may result in a higher number of pharmacist suggestions maintained at discharge. Currently at KHSC, novel methods of electronic communication for discharge planning between pharmacists and physicians are being explored.
Figure 1. Patient Eligibility in the Pre-Intervention Phase

Patients Meeting Inclusion Criteria
\( n = 59 \)

Initial Exclusions
- Previous Admission \( n = 2 \)
- Suspected GI bleed \( n = 1 \)
- Palliative on Admission \( n = 1 \)

\( n = 55 \)

Follow Up Exclusions
- Transferred \( n = 4 \)
- Expired \( n = 5 \)
- Palliative \( n = 1 \)

Patients Analyzed
\( n = 45 \)

Figure 2. Patient Eligibility in the Intervention Phase

Patients Meeting Inclusion Criteria
\( n = 41 \)

Initial Exclusions
- Previous Admission \( n = 7 \)
- Suspected GI bleed \( n = 6 \)
- Palliative on Admission \( n = 1 \)

\( n = 27 \)

Follow Up Exclusions
- Transferred \( n = 3 \)
- Expired \( n = 1 \)
- Not discharged \( n = 1 \)
- Discharged before assessment \( n = 1 \)

Patients Analyzed
\( n = 21 \)
Figure 3. PPI Indications in the Intervention Phase

**Patients for Whom Deprescribing was Appropriate**

- **GERD** treated for at least 4 - 8 weeks: n = 2
- Unknown: n = 3
- Other: n = 2

*GERD* = Gastroesophageal Reflux Disease

**Patients for Whom Deprescribing was Not Appropriate**

- Chronic NSAID Use with Bleeding Risk: n = 1
- Severe Esophagitis: n = 5
- Documented History of Bleeding Ulcer: n = 3
- Other: n = 5
Figure 4. Process of Pharmacist-Led Deprescribing in the Intervention Phase

- **Patients Assessed for Deprescribing by Investigator**
  - **n = 21**

- **Deprescribing Appropriate**
  - **n = 7**

- **Patient Agreeable to Deprescribing**
  - **n = 6**

  - **Recommendation made to Team by Clinical Pharmacist**
    - **n = 3**

    - **Physician Agreeable to Recommendation and PPI deprescribed in hospital**
      - **n = 3**

    - **PPI Deprescribed at Discharge**
      - **n = 1**

  - **Deprescribing Not Appropriate**
    - **n = 14**

    - **Patient Not Agreeable to Deprescribing**
      - **n = 1**

    - **Investigator Suggestion Not Addressed by Clinical Pharmacist**
      - **n = 3**

- **Average time used by investigator to apply deprescribing tool**: 9 ± 5 (SD) minutes per patient

- **PPI Continued at Discharge**
  - **n = 2**
**Table 1. Baseline Characteristics**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Pre-Intervention (n=45)</th>
<th>Intervention (n=21)</th>
<th>P-value</th>
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<tr>
<td>Age in years Mean ± SD</td>
<td>73 ± 13</td>
<td>76 ± 17</td>
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<td>Male - No. (%)</td>
<td>22 (49%)</td>
<td>10 (48%)</td>
<td>0.923</td>
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<tr>
<td>Female - No. (%)</td>
<td>23 (51%)</td>
<td>11 (52%)</td>
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<tr>
<td>No. of Home Medications Mean ± SD</td>
<td>14 ± 6</td>
<td>13 ± 4</td>
<td>0.399</td>
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**Table 2. Percentage of PPIs Deprescribed**

<table>
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<tr>
<th>Deprescribed % (No.)</th>
<th>Pre-Intervention (n=45)</th>
<th>Intervention (n=21)</th>
<th>P-value</th>
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</thead>
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<tr>
<td>6.4% (3)</td>
<td></td>
<td>14.3% (3)</td>
<td>0.373</td>
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</tbody>
</table>
References


<5>Canadian Institute for Health Information (CIHI) — Prescribed Drug Spending in Canada, 2013.


