DEPRESCRIBING PROTON PUMP INHIBITORS: THE IMPACT OF A QUALITY IMPROVEMENT INITIATIVE IN A RURAL CANADIAN FAMILY MEDICINE CLINIC

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Abstract

Long-term use of multiple medications is a risk factor for morbidity and mortality. Proton pump inhibitors treat upper gastrointestinal disorders such as gastro-oesophageal reflux disease and peptic ulcers, and are a commonly prescribed medication in Canada. Their effectiveness and high tolerance have led to their use without proper indication and for prolonged periods. Chronic proton pump inhibitor use is associated with kidney disease, decreased bone density, hypomagnesemia, and susceptibility to infections such as *C. difficile* and pneumonia.

This study aimed to deprescribe unnecessary proton pump inhibitors in the patients of the Uxbridge Family Health Centre. Utilising Choosing Wisely Canada's toolkit entitled "Bye-bye, PPI", the Health Team's physicians identified eligible patients with whom they discussed the benefits of deprescribing. Patients who agreed to attempt deprescribing received an information handout and a follow-up call four weeks later.
From June 2019 to March 2020, 48 patients who had been taking proton pump inhibitors for more than eight weeks were consulted, of which 42 were eligible for deprescribing. All 42 eligible patients agreed to attempt deprescribing. After four weeks, 30 patients (71%) had successfully discontinued proton pump inhibitors, one patient (2%) reduced their dosage, and 11 patients (26%) were unsuccessful in deprescribing. For those patients who discontinued or reduced proton pump inhibitor use, there was a 73% success rate overall in deprescription. Deprescribing can reduce harm to patients and improve quality of life. When provided with effective tools, physicians and patients can successfully stop or reduce inappropriately prescribed proton pump inhibitors.

Introduction

In 2016, the Canadian Institute for Health Information reported that 35.3% of Canadian seniors were chronically prescribed and using at least five different medications classes[1]. After statins, the second most common class of medication prescribed to seniors in Canada were proton pump inhibitors (PPIs), which had a 23.5% rate of chronic use in this population[1]. Polypharmacy typically refers to the long-term use of more than five medications, and has been associated with elevated rates of long-term care admission, hospitalisation and death[2, 3].

PPIs prevent gastric acid secretion by binding antagonistically to gastric H^+/K^+ ATPase proton pumps. Many upper gastrointestinal disorders, including gastro-oesophageal reflux disease (GERD) and duodenal and gastric ulcers, are treated with PPIs[4]. PPIs are well tolerated and effective, leading to their prescription without indication and often for prolonged periods without reassessment of symptoms[4]. Long-term PPI use is associated with kidney disease, decreased bone density, hypomagnesemia, and susceptibility to infections such as *C. difficile* and pneumonia[4]. The Canadian Association of Gastroenterology and the Canadian Pharmacists Association recommend that physicians attempt to either terminate or reduce the use of PPIs in eligible patients with gastrointestinal symptoms at least once per year[5, 6]. The Canadian Society of Hospital Pharmacists recommends that unless there is a compelling reason to continue a patient on a PPI, that prescription should not continue after discharge from the hospital[7].

Choosing Wisely Canada (CWC) developed a toolkit called "Bye-bye, PPI" which was created in response to the Walsh et al.'s PPI deprescribing initiative in 2016, which saw a 26% success rate[8, 9]. Deprescribing is the supervised process of reducing or stopping the use of unnecessary medication. CWC's toolkit was utilised in this study by family physicians in the rural community of Uxbridge, Ontario. This study aimed to encourage and equip physicians of the Uxbridge Family Health Clinic to deprescribe unnecessary PPIs in their patient population.

Materials and Methods

All nine family physicians at the Uxbridge Family Health Centre agreed to participate in this quality improvement initiative. This project was conducted to improve practice at the Uxbridge Health Centre, and thus was exempt from full ethical review. Each physician received a personalised folder containing the following:

1. List of physician's patients who met the inclusion criteria

A search of each physician's patient population via Practice Solutions Electronic Medical Records (EMRs) identified those who were at least 18 years of age and had been continuously prescribed PPIs for at least eight weeks at the time.

2. "Proton-Pump Inhibitor (PPI) Deprescribing Algorithm" (Figure 1)

This sheet obtained by Farrell *et al.* provided physicians with a comprehensive guide to determine patient eligibility for PPI deprescribing[10]. Farrell et al. state that "Barrett's esophagus, severe esophagitis, documented history of bleeding GI ulcer" are exclusion criteria for PPI deprescribing, and that "chronic NSAID users with bleeding risk" are also ineligible. This algorithm is also available on page 10 of CWC's toolkit[8].

3. "Proton-Pump Inhibitor (PPI) Deprescribing Notes" (Figure 2)

This sheet was also obtained by Farrell et al. and served as a guideline for PPI use, which listed the PPIs available in Canada and included their indications and recommended dosages[10]. The sheet advised physicians on how to taper doses, engage patients and caregivers in PPI deprescribing, explain the side effects of long-term PPI use, and describe the benefits of deprescribing to patients. This page is also available on page 11 of CWC's toolkit[8].

4. Choosing Wisely Canada's Algorithm8

This is a second algorithm that physicians used to determine eligibility for PPI deprescribing. This algorithm has the same inclusion and exclusion criteria for PPI deprescribing and describes how to use past medical history to determine eligibility if the physician is unsure whether the patient has an indication for long-term PPI use.

5. "Stopping your Proton Pump Inhibitor or "PPI""

This two-page handout obtained from RxFiles and adapted by CWC explains in layman's terms what PPIs are, the adverse effects of long-term or inappropriate use of PPIs, and the conditions that require long-term PPI use[11]. A four-step process details how to successfully reduce and eliminate PPI use, with guidance on how to relieve symptoms that may reoccur in doing so. This sheet was embedded in the EMR menu, which allowed physicians to print it off for patients.

Each physician was oriented to their folder's contents by the study's principal researcher to ensure a complete understanding of the initiative. An electronic reminder was added to each listed patient's chart, which encouraged physicians to determine patient eligibility for deprescribing at the patient's next visit. Three prompts were added to the patients' charts to be used by the physician during the visit, which are described in Figure 1.

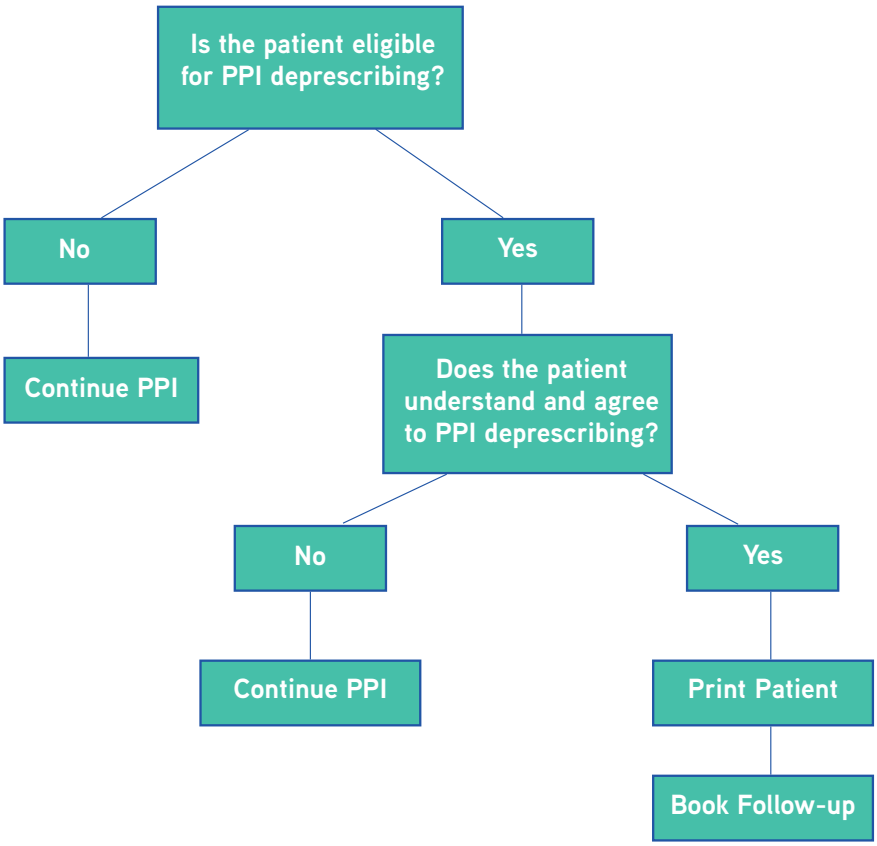

Figure 1: Prompts embedded in patient EMRs as guidelines for a consultation about PPI deprescribing. If a patient was eligible for PPI deprescribing, the physician would initiate a conversation about the long-term effects of PPI use, and how deprescribing may benefit them. If the patient agreed to attempt deprescribing, they were provided with a printed copy of the CWC patient handout which was embedded in the EMR. A follow-up call was booked for four-weeks' time during which the physician or a nurse would record the patient's success at deprescribing and report it to the principal researcher[8].

Results

From June 2019 to March 2020, four of the nine physicians consulted 48 patients from the PPI list. Forty-two of those 48 patients were candidates for PPI deprescribing, all of which (100%) agreed to attempt to stop or reduce their PPI dose. After four weeks, 30 of the 42 patients (71%) had successfully stopped consuming PPIs altogether, and 11 (26%) were unsuccessful. One patient (2%) was able to tolerate a reduced PPI dose. A successful deprescription includes both a reduced or stopped dose. Therefore, there was a 73% four-week deprescribing success rate of PPIs in eligible patients. Patients of a broad range of ages participated in this study, highlighted in Table 1. Sixty-seven percent of patients aged 18 to 39 who attempted to deprescribe were successful. Of the patients aged 40 to 59 years, 64% were successful in deprescribing. The largest group of patients were aged 60-79 years, who achieved an 89% success rate. Seven patients over 80 years of age attempted to deprescribe PPIs, of which 57% were successful.

Table 1: PPI deprescribing attempts by age group.

Age (years)	Total (# of patients)	Stopped	Reduced dose	Unsuccessful	Success rate
18-39	3	1	1	1	66%
40-59	14	9	0	5	64%
60-79	18	16	0	2	88%
80+	7	4	0	3	57%
All ages	42	30	1	11	73%

Discussion

The findings from this study suggest that physicians can educate their patients on the importance of deprescribing unnecessary medications and take steps to do so successfully when given the appropriate tools. The use of multiple medications introduces the risk of drug-drug interactions, adverse effects, inappropriate dosing, and drug-disease interactions, so physicians must regularly monitor their patients' medications and their appropriateness[12]. Deprescribing unnecessary medications is a way to decrease the burden of polypharmacy and improve quality of life[13]. Polypharmacy is a risk factor for morbidity and mortality in seniors; thus, deprescribing unnecessary PPIs in the senior population is of particular clinical importance.

There is existing evidence that deprescribing PPIs is feasible and can be successfully done with a suitable methodology. As previously mentioned, Walsh et al. developed a tool that saw successful PPI deprescribing in 11 out of 46 consulted patients, for a success rate of 26%[9]. This study had a similar number of patients who agreed to attempt deprescribing as Walsh et al.; however, this study had a greater success rate (73% vs 26%). A possible reason for this disparity in success rates is that follow-up to determine deprescribing success was conducted at four weeks in this study, while Walsh conducted follow-up at ten weeks[9]. Four-week deprescribing results may not be indicative of the longer-term results. On the other hand, this study's high success rate may be due to the level of knowledge that the physicians had on the topic, which they were able to translate to their patients to encourage deprescribing. Additionally, as Uxbridge is a rural community, the physician-patient relationships in the practice may include a unique level of trust, leading to patients being more willing to discontinue PPI use.

Thompson et al. implemented a PPI deprescribing guideline in an Ontario long-term-care home that saw successful deprescribing within six months of guideline introduction, but it was not maintained beyond six months[14]. This study in Uxbridge had successful short-term PPI deprescribing yet did not look past four weeks. Thompson's study suggests that further measures should be taken to ensure long-term PPI deprescribing, which was absent from this study[14].

Odenthal et al. utilised a novel pharmacist-managed PPI tapering program in a Minnesota family medicine practice[15]. Twenty-two eligible patients agreed to attempt deprescribing, 86% of which completely stopped, 9% reduced their dosage, and 5% were unsuccessful after eight weeks in the study. In combining the successful

patients in stopping and reducing their PPI dose, Odenthal et al. saw a 95% success rate in PPI deprescribing. This study's success rate was 73%, which was lower than Odenthal et al.'s. Such a disparity may be due to the unique deprescribing methodology that Odenthal et al. used. This study may have benefitted from engaging with local pharmacists and providing patients with a more structured PPI tapering plan to further encourage deprescription in interested patients.

A limitation of this study is that there was no follow-up with patients past the four-week mark; therefore, the success' longevity is unknown. Ongoing follow-up with the patients who participated in this study would provide a more significant indication of whether or not this initiative was successful in the long term.

A second limitation to this study is that the patient handout recommended patients use an H2 blocker such as ranitidine (Zantac), to relieve breakthrough GERD symptoms after coming off PPIs[11]. In September of 2019, shortly after commencing this study, the FDA announced the presence of nitrosodimethylamine, a probable carcinogen, in ranitidine, which led to a worldwide precautionary recall of the drug in pharmacies[16, 17]. Since then, Health Canada has enacted safety measures that companies must adhere to produce ranitidine; however, this medication's safety remains a concern for many, and its availability is unreliable[17]. The recall of ranitidine introduced a barrier in this study as patients could not reliably use it to relieve their rebound symptoms after stopping PPI use. Physicians may have been less willing to recommend deprescribing without having a known safe alternative to control symptoms. A separate study may need to occur to see if this barrier reduced the number of interested patients in this study.

A third limitation of this study is that there was relatively little physician engagement in the initiative. Of the nine trained physicians, only four participated in the initiative. This may have been due to the time constraints preventing extensive physician-patient discussion in a busy rural family practice. The recall of ranitidine may have led physicians to withdraw from participating as they had few options for alternative medication to assist patients with their rebound symptoms. One physician went on leave during the study period, and despite their locum physician being trained on this initiative, there was little participation. This may have been due to the lack of relationship between the locum physician and patients, which prevented the physician from recommending PPI deprescribing during a consultation. Incentives designed to increase physician participation were not markedly effective. Scheduling dedicated appointments for PPI deprescribing with eligible patients would allow for greater focus and time spent on the initiative.

This study's clinical implications align with previous work suggesting that unnecessary chronic PPI use can stop by relatively simple interventions in family practice[9, 14, 15]. This study utilized CWC's toolkit, and its success may encourage other family physicians to do the same to deprescribe PPIs in their practice.

CWC's toolkit recommended a four-week follow-up with patients, but since Thompson et al. saw little success in long-term PPI deprescribing, future research geared to enforcing long-term PPI deprescription may provide insight into how to do so successfully[14]. Determination of impact of ranitidine's recall on PPI deprescribing may be an area for future research, as patients throughout the world may have inappropriately remained on PPIs due to the lack of a safe alternative.

Conclusion

This study aimed to reduce unnecessary PPI use in the Uxbridge Family Health Centre patient population. Thirty of 42 (71%) eligible patients stopped their PPI use, and one of 42 (2%) reduced their PPI use after four weeks. Since deprescribing involves stopping or reducing the dose of an unnecessary medication, this study had a 73% success rate in deprescribing PPIs, confirming that the study's aim was achieved.

Recommendations for refinement of the methodology include incorporating longer-term follow-up and redesigning the patient handout to include alternatives to ranitidine.

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