

Managing Proton Pump Inhibitor Use in Older Adults

This tool is designed to help primary care providers assess and discuss with their patients 65 years of age or older, the potential benefits and risks of proton pump inhibitors (PPIs). This tool contains steps to support primary care providers in safely discontinuing, starting or continuing to prescribe PPIs for their older patients.

SECTION A: Potential risks and benefits of PPIs

Many common indications for PPI use require short-term treatment. However, chronic use of PPIs has become problematic and rampant.¹ PPIs are often viewed as safe and well-tolerated medications, and while the incidence of risks might be small, older adults are more susceptible due to comorbid conditions. When PPIs are inappropriately prescribed or used for too long, they can contribute to polypharmacy-related adverse reactions, medication errors, drug interactions, emergency department visits and hospitalizations.¹

POTENTIAL RISKS FROM LONG-TERM (≥ 1 YEAR) USE ^a	POTENTIAL BENEFITS FROM SHORT-TERM USE ^b	
<ul style="list-style-type: none"> Increased risk of hip fracture² <ul style="list-style-type: none"> NNH at 1 year = 4167 for women and 6667 for men³ Clostridium difficile infection² <ul style="list-style-type: none"> NNH at 1 year = 1000³ Acute interstitial nephritis⁴ Community-acquired pneumonia² <ul style="list-style-type: none"> NNH at 1-6 months = 556³ Low levels of the mineral magnesium in the blood² Vitamin B12 deficiency⁴ <ul style="list-style-type: none"> NNH at 1 year = 4⁵ 	<ul style="list-style-type: none"> Uninvestigated gastroesophageal reflux disease (GERD): heartburn remission <ul style="list-style-type: none"> PPI 72% vs. placebo 25%, NNT at 1-12 weeks = 2* Prevention of NSAID-associated peptic ulcer <ul style="list-style-type: none"> PPI 14% vs. placebo 36%, NNT at >3 weeks = 4 Reflux (erosive) esophagitis <ul style="list-style-type: none"> Acute healing <ul style="list-style-type: none"> PPI 83% vs. placebo 28%, NNT at 8 weeks = 2* Maintenance of healed esophagus <ul style="list-style-type: none"> PPI 78% vs. placebo 21%, NNT at 8 weeks = 2* Maintenance of symptom relief <ul style="list-style-type: none"> PPI 71% vs. placebo 24%, NNT at 8 weeks = 2* 	<ul style="list-style-type: none"> Endoscopy negative reflux disease: heartburn remission <ul style="list-style-type: none"> PPI 38% vs. placebo 13%, NNT at 4-8 weeks = 4* Functional (non-ulcer) dyspepsia: improvement in dyspepsia <ul style="list-style-type: none"> PPI 34% vs. placebo 36%, NNT at 2-8 weeks = 10* Helicobacter pylori eradication (HPE) for peptic ulcer disease: ulcer recurrence <ul style="list-style-type: none"> Duodenal ulcer <ul style="list-style-type: none"> HPE 13% vs. placebo 67%, NNT at ≤2 weeks = 2* Peptic ulcer <ul style="list-style-type: none"> HPE 16% vs. placebo 50%, NNT at 4-8 weeks = 3*

^aDue to the observational nature of the evidence, harms observed may be over-represented due to potential confounding

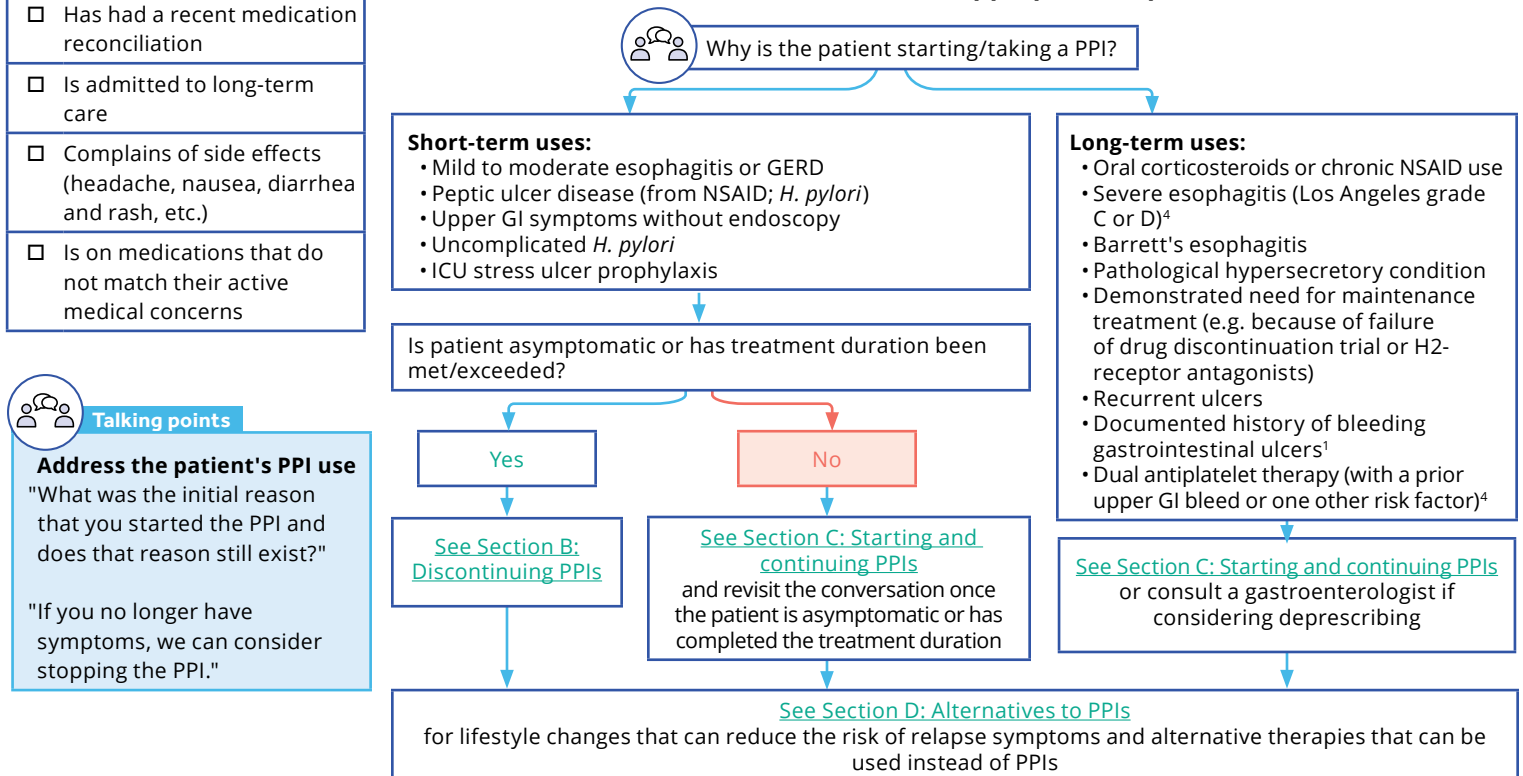
^bQuality of evidence unclear

*Moderate quality of evidence

DISCUSS WITH A PATIENT THEIR USE OF PPIs WHEN A PATIENT:
<input type="checkbox"/> Is ≥ 65 years of age
<input type="checkbox"/> Comes in for a prescription renewal or refill
<input type="checkbox"/> Has had a recent hospitalization
<input type="checkbox"/> Has had a recent medication reconciliation
<input type="checkbox"/> Is admitted to long-term care
<input type="checkbox"/> Complains of side effects (headache, nausea, diarrhea and rash, etc.)
<input type="checkbox"/> Is on medications that do not match their active medical concerns

TIPS FOR REVIEWING PPI USE WITH PATIENTS
<input checked="" type="checkbox"/> Set EMR reminders or patient record flags to review a patient's PPI use during their next appointment.
<input checked="" type="checkbox"/> Encourage patients to talk about their PPI use at their next appointment: 1) hand out patient material to patients ages ≥ 65 or over; 2) put waiting room patient posters up; or, 3) provide screening questions while patients wait for their appointments. This type of patient material is available from the Canadian Deprescribing Network . ⁷

Determine whether a PPI is appropriate or problematic¹



Talking points

Address the patient's PPI use
"What was the initial reason that you started the PPI and does that reason still exist?"

"If you no longer have symptoms, we can consider stopping the PPI."

SECTION B: Discontinuing PPIs



Tapering steps

If taking a PPI is no longer appropriate for a patient, then use the following steps to help the patient taper off of the medication or taper to a lower dose.⁸

1. BEFORE STARTING A TAPER

Ensure that lifestyle changes and alternative therapies are implemented to reduce the risk of relapse symptoms during or following the taper (see [Section D: Alternatives to PPIs](#))



Talking points

Emphasize the need to reduce polypharmacy

"I want you taking only the medications that you need. Let's see if we can take you off unnecessary medications to help you feel better."

Frame discontinuing PPIs as a trial

"Let's try taking you off the PPIs to see how you feel? If any symptoms come back, you can tell me. We can always restart the dose that you need to feel comfortable."

Reassure a patient that a PPI will be tapered instead of stopped completely

"Most patients are successful in tapering off of their PPIs. Sometimes, patients slowly decrease the dose to help their body adjust, but often, patients don't notice a recurrence of their symptoms."

2. PLAN THE TAPER

There is no evidence that one tapering approach is better than another. The tapering plan should be based on patient preference and what plan seems most tolerable.

- **Engage patients** in developing a clear plan for tapering
 - Find out when the patient's symptoms are most severe and customize their tapering plan
- **Establish the method of tapering**
 - Identify whether the [Ontario Drug Benefit \(ODB\)](#)¹⁴ covers the doses you plan to use during tapering ([see PPIs available in Ontario](#)) and if not, consider alternate-day dosing or switching to another PPI [that is covered]
- **Potential tapering methods:**
 - Reduce the dose from twice daily to once daily⁸
 - Reduce the dose from daily to every second or third day⁸
 - Stop the PPI and replace it with H2 blockers
 - Reduce the dose to PRN
- **Include a note in the prescription** to inform the pharmacist of the tapering plan
- **Consult the pharmacist** if pill splitting is necessary to accommodate tapering doses and to discuss packaging options for older adults (e.g. dosette or blister pack)

3. INITIATE THE TAPER AND MONITOR

- **Initiate the taper**
- **Ask the patient to call in 2-4 weeks to report any relapse symptoms**
 - Ask the patient if they are experiencing:
 - Heartburn
 - Reflux (used synonymously with heartburn)
 - Sore throat (i.e. difficulty swallowing)
 - New onset of coughing
 - Abdominal pain
 - Alternatively, if the patient is non-verbal, use a visual analogue scale (VAS) to identify pain or discomfort due to symptom relapse and look for signs of:⁹
 - Weight or appetite loss
 - Behavioural changes (e.g. agitation)
- **If the patient experiences withdrawal and/or rebound acid reflux, suggest using non-pharmacological and non-PPI pharmacological alternatives to lessen symptoms** ([see Section D: Alternatives to PPIs](#))
 - If the patient does not tolerate the taper and the taper interferes with their normal activities, determine if the patient should return to a previous PPI dose
 - If the patient is still experiencing a recurrence of symptoms, test for *H. pylori* and contact a GI specialist for further consultation

SECTION C: Starting and continuing PPIs

For patients starting or continuing on a PPI, use the following information to ensure that the PPI is prescribed safely, considering individual patient factors.

IMPORTANT INFORMATION TO COLLECT BEFORE STARTING A PPI

- Preexisting conditions that require a GI referral:
 - **Dysphagia¹⁰**
 - **Odynophagia¹⁰**
 - **GI bleeding/anemia¹⁰**
 - **Recurrent vomiting¹⁰**
 - **Weight loss¹⁰**
- Dietary patterns and triggers (i.e. caffeine, alcohol, foods high in acid, nicotine)
- All prescribed and over-the-counter medications that the patient is currently taking, including supplements, vitamins and naturopathic treatments (see [Medications that interact with PPIs](#))
- History of previous non-pharmacological (i.e. lifestyle changes) and pharmacological alternatives tried (see [Section D: Alternatives to PPIs](#))
 - An adequate trial of non-pharmacological and pharmacological alternatives is approximately 6-8 weeks¹¹
- History of adverse events

TIPS FOR SAFE PPI PRESCRIBING

- Ideally, limit a prescription to 2-8 weeks (high-risk patients might need more than 8 weeks; [see the section below](#) to identify high-risk conditions)
- Discuss a tapering plan before prescribing a PPI (see [Talking points](#))
- Consult with your local GI specialist before concomitantly administering antisecretory agents because of the marked reduction in acid inhibitory effects
 - Examples include, histamine-2 receptor antagonists (H2RAs), analogues of prostaglandin E (e.g. misoprostol) and somatostatin analogues (e.g. octreotide)¹²
- Set EMR reminders or patient record flags to prompt you to revisit PPI use at the patient's next visit and ask your patient to book a follow-up appointment within 4-8 weeks



Talking points

Provide instructions on when to take a PPI

"Take your PPI 30-60 minutes before you eat your breakfast in the morning, with a glass of water (not coffee), or before your last meal of the day."

Discuss a tapering plan before prescribing a PPI

"We will start you on the PPI and then we will slowly decrease your dose once you start feeling better."

CONTINUING PPIs

- First, it is important to determine if the chronic use of a PPI is warranted. Consider if the original indication for the PPI or ongoing risk factors for GI disease are present.



The following are high-risk conditions that may require long-term PPI use:

- **Barrett's esophagitis¹³**
 - **Chronic oral corticosteroids or chronic NSAID use¹³**
 - **Grade C or D esophagitis⁴**
 - **Documented history of bleeding GI ulcers¹³**
 - **Dual antiplatelet therapy (with a prior upper GI bleed or one other risk factor)⁴**
- ✓ Set annual EMR reminders or patient record flags to re-assess PPI use in patients with high-risk conditions

- Seek advice from a GI specialist for high-risk patients to assess ongoing risk factors

SECTION C: Starting and continuing PPIs (continued)

PPIs AVAILABLE IN ONTARIO					
PPI	Type	Standard daily dose (healing)*	Low daily dose (maintenance)	ODB coverage	Cost
Dexlansoprazole* (Dexilant®)	Capsule	30 ^a mg or 60 ^b mg	30 mg	No**	\$\$\$\$
Esomeprazole** (Nexium®)	Tablet	20 ^c mg or 40 ^d mg	20 mg	No**	\$\$\$\$
Lansoprazole* (Prevacid®)	Capsule	30 mg [^]	15 mg [^]	Yes • Lansoprazole is limited use ¹⁵	\$
Omeprazole** (Losec®)	Capsule	20 mg [^]	10 mg [^]	Yes • Some omeprazole is covered but is limited use ³⁸ • All omeprazole magnesium is covered but is limited use ³⁸ • 10 mg is not covered**	\$
Pantoprazole* (Tecta®, Pantoloc®)	Tablet	40 mg	20 mg	Yes • Pantoprazole magnesium is covered ³⁹ • Pantoprazole sodium is covered but is limited use ³⁹ • 20 mg is not covered**	\$
Rabeprazole* (Pariet®)	Tablet	20 mg	10 mg	Yes	\$

Legend: \$=<\$15, \$\$=\$15-30, \$\$\$=\$30-45, \$\$\$\$=\$45-60, \$\$\$\$\$=\$60-75,

*= Standard dose PPI taken BID only indicated in the treatment of peptic ulcer caused by *H. pylori*; PPI should generally be stopped once eradication therapy is complete unless risk factors warrant continuing PPI

**= If the patient is on this PPI and needs to taper to smaller doses: stay at the higher dose but switch to alternating days OR contact the patient or their family/caregiver to see if they approve the cost of smaller doses

+ = available over the counter: Esomeprazole 20 mg (Nexium 24HR capsules) and Omeprazole 20 mg (Omepr Acid Reducer capsules, Heartburn Control capsules and Riva brand omeprazole)

a= Symptomatic non-erosive gastroesophageal reflux disease, b= Healing of erosive esophagitis, c=Non-erosive reflux disease, d= Reflux esophagitis, ^=Can be sprinkled on food

Note: reference to brand names does not imply endorsement of any of these products

MEDICATIONS THAT INTERACT WITH PPIs			
Medications	Decreases absorption/ levels of PPI	PPI decreases efficacy/ absorption	PPI increases drug exposure (half-life or area under the curve [AUC])/toxicity
Ampicillin ¹⁶		●	
Calcium supplements ¹⁶		●	
Carbamazepine ¹⁷			● applies to omeprazole only
Cimetidine ¹⁶	● applies to omeprazole only		
Clomipramine ¹⁶		● applies to omeprazole only	
Diazepam ¹⁷			● applies to omeprazole only
Digoxin ¹⁷			● applies to omeprazole and rabeprazole only
Ginkgo ¹⁶	● applies to omeprazole only		
HIV protease inhibitors ¹²		●	
Iron ¹⁶		●	
Itraconazole ¹⁶		●	
Ketoconazole ¹⁶		●	
Methotrexate ¹²			●
Phenytoin ¹²			● applies to omeprazole only
Rifampin ¹⁶	● applies to omeprazole only		
Theophylline ^{12,16}			● applies to lansoprazole only
Warfarin ¹⁷			● applies to omeprazole only

SECTION D: Alternatives to PPIs

Alternatives to managing GERD or esophagitis⁸

i. Non-pharmacological

Older adult patients can manage their GERD or esophagitis by incorporating the following lifestyle changes into their daily routines.⁸

Treatment	Level of evidence
 <p>Avoid lying down for 2-3 hours after you eat^{18,21}</p>	•
 <p>Avoid wearing tight clothing¹⁸</p>	•
 <p>Elevate the head of the bed (try placing a firm pillow between the mattress and the bed frame), particularly if nocturnal or laryngeal reflux symptoms are present¹⁸</p>	•••
 <p>Modify diet:</p> <ul style="list-style-type: none"> • Increase fibre intake to decrease heartburn¹⁹ • Avoid chocolate, alcohol, caffeine, acidic citrus juices, large fatty meals, spicy food and peppermint¹⁸ • Choose smaller quantities and eat slowly²⁰ 	•••
 <p>Reduce bodyweight if BMI >30 kg/m² or reverse recent weight gain¹⁸</p>	•••
 <p>Smoking cessation¹⁸</p>	•



Talking points

"Heartburn is common. This is why we have effective over-the-counter medicine to help, which are often safer options."

"You may experience rebound symptoms, but they often go away with time and lifestyle changes. You can trial over-the-counter medication when you have rebound symptoms."

"Avoid chocolate, alcohol, caffeine, acidic citrus juices, large fatty meals, spicy food and peppermint. All of these foods can give you heartburn. Try increasing your intake of fruits, vegetables, protein and complex carbohydrates."²²

Level of evidence: •••• = meta-analysis or systematic review of randomized controlled trials, ••• = individual randomized controlled trial, •• = systematic review of cohort studies, • = individual cohort study or expert opinion

SECTION D: Alternatives to PPIs (continued)

ii. Pharmacological

Medications with ODB¹⁴ coverage can be prescribed to patients if they are concerned about the cost of obtaining them over-the-counter. When possible and appropriate, eliminate drugs that impair esophageal motility and lower esophageal sphincter tone (e.g. anticholinergic agents, beta-adrenergic agonists, calcium channel blockers, theophylline and tricyclic antidepressants).^{18,31}

Treatment	Level of evidence	Dose	Notes	Side effects	ODB coverage
Antacids					
Aluminum hydroxide/magnesium hydroxide combinations (Diovol®) ^{18,29}	••••	30 mL (regular strength) PRN after meals ¹⁸	Avoid antacids containing magnesium or aluminum in renal dysfunction ¹⁸	Constipation, diarrhea ¹⁸	No
Alginates					
Aluminum hydroxide (Gaviscon® liquid) ^{18,29}	••••	10–20 mL PRN after meals ¹⁸	Alginates and some antacids contain significant amounts of sodium ¹⁸	Nausea, vomiting, belching, flatulence ¹⁸	No
Magnesium carbonate (Gaviscon® tablets) ^{18,29}	••••	2–4 tablets chewed PRN after meals followed by a drink of water ¹⁸		Nausea, vomiting, belching, flatulence ¹⁸	No
Histamine H2-receptor antagonists *If creatinine clearance level is <50 mL/min then reduce dose to avoid mental status changes ²⁷					
Cimetidine (Tagamet®) ^{18,34}	•••	400 mg twice daily ¹⁶		Diarrhea, constipation, headache, fatigue, confusion (most likely in older adults and those with poor renal function), cardiac effects, rash Gynecomastia, impotence (rare) ¹⁸	Yes - generic only
Famotidine (Pepcid AC®, Pepcid AC Maximum Strength®) ^{18,33}	•••	20 mg twice daily ¹⁶	Available without a prescription ¹⁸ Antacids may be given concomitantly if needed ¹⁸	Diarrhea, constipation, headache, fatigue, confusion (most likely in older adults and those with poor renal function), cardiac effects, rash ¹⁸	Yes - generic only
Nizatidine (Axid®) ^{18,32}	•••	150 mg twice daily ¹⁶			Yes - only brand name available
Ranitidine* (Zantac, Zantac Maximum Strength®) ^{18,35}	•••	150 mg twice daily ¹⁶	Available without a prescription ¹⁸		Yes - generic only

Level of evidence: •••• = meta-analysis or systematic review of randomized controlled trials, ••• = individual randomized controlled trial, •• = systematic review of cohort studies, • = individual cohort study or expert opinion.

Legend: * = Currently unavailable in Canada due to the 2019 recall and contamination. Consult Health Canada and the FDA for updates.

iii. Other alternatives

The following alternatives do not have the same efficacy as the non-pharmacological and pharmacological alternatives, but can alleviate minor symptoms of heartburn, reflux or stomach pain.

Treatment	Side effects/adverse events
Bismuth subsalicylate (Pepto Bismol®)	Salicylate toxicity, black tongue, black stool, bismuth-induced encephalopathy ²⁸
Calcium carbonate and magnesium hydroxide (Rolaids®)	Hypercalcemia, hypermagnesemia, milk-alkali syndrome, nephrolithiasis, abdominal pain, constipation, dehydration, diarrhea, hypercalcemia, hypercalciuria, hypomagnesemia, nausea, vomiting ²⁶
Calcium carbonate (Tums®)	Constipation and nausea are the most common side effects, and other possible side effects include hypercalcemia, hypercalciuria, renal calcification and renal stones There may be an increased risk of MI with high supplement doses ³⁷
Magnesium hydroxide (Milk of Magnesia®)	Hypermagnesemia in renal dysfunction ²⁴

Note: reference to brand names does not imply endorsement of any of these products.

RESOURCES

Provider resources

- [i] Canadian Family Physician deprescribing proton pump inhibitors clinical practice guideline <https://www.cfp.ca/content/63/5/354>
- [ii] Choosing Wisely Canada bye-bye, PPIs https://choosingwiselycanada.org/wp-content/uploads/2017/07/CWC_PPI_Toolkit_v1.2_2017-07-12.pdf
- [iii] Deprescribing.org webinars <https://deprescribing.org/resources/deprescribing-webinars/>
- [iv] PPI Deprescribing.org algorithm <https://www.cfp.ca/content/cfp/suppl/2017/05/05/63.5.354.DC1/Algorithm.pdf>
- [v] 2019 AGS Beers Criteria® list of potentially inappropriate medications in older adults published by the American Geriatrics Society <https://geriatricscareonline.org/ProductAbstract/american-geriatrics-society-updated-beerscriteria-for-potentially-inappropriatemedication-use-in-older-adults/CL001>

Patient resources

- [i] Choosing Wisely Canada using proton-pump inhibitors (PPI) carefully <https://choosingwiselycanada.org/wp-content/uploads/2017/05/GERD-EN.pdf>
- [ii] Deprescribing.org PPI info sheet https://www.cfp.ca/content/cfp/suppl/2017/05/05/63.5.354.DC1/PPI_InfoSheet.pdf
- [iii] Mayo Clinic video on reducing heartburn, acid reflux and GERD <https://www.youtube.com/watch?v=jsT1y1Tz3d8>
- [iv] Deprescribing.org PPI patient decision aid <https://deprescribing.org/wp-content/uploads/2017/10/PPI-Consult-PtDA-Oct-11-v2-wt.pdf>

References

- [1] Canadian Family Physician (CFP). Deprescribing proton pump inhibitors. 2017. [cited 2019 July 19]. Available from <https://www.cfp.ca/content/63/5/354>
- [2] Choosing Wisely Canada. Treating Heartburn and Gastro-Esophageal Reflux (GERD): Using Proton-Pump Inhibitors (PPI) carefully. [cited 2019 October 23]. Available from <https://choosingwiselycanada.org/wp-content/uploads/2017/05/GERD-EN.pdf>
- [3] Deprescribing. Should I keep taking my acid reflux medication? [cited 2019 October 23]. Available from <https://deprescribing.org/wp-content/uploads/2017/10/PPI-Consult-PtDA-Oct-11-v2-wt.pdf>
- [4] Choosing Wisely Canada. Bye-bye, PPI. 2019. [cited 2019 August 20]. Available from https://choosingwiselycanada.org/wp-content/uploads/2017/07/CWC_PPI_Toolkit_v1.2_2017-07-12.pdf
- [5] Benmassaoua A, McDonald EG, Lee TC. Potential harms of proton pump inhibitor therapy: rare adverse effects of commonly used drugs. CMAJ. 2016 Jun 14;188(9):657–662.
- [6] RxFiles. PPI Deprescribing. 2015 (partial update June 2017. [cited 2019 July 28]. <https://www.rxfiles.ca/rxfiles/uploads/documents/PPI-Deprescribing-Newsletter.pdf>
- [7] Canadian Deprescribing Network. Health Care Professionals. [cited 2019 October 1]. Available from <https://www.deprescribingnetwork.ca/professionals>
- [8] Deprescribing. Is a Proton Pump Inhibitor still needed? 2016. [cited 2019 July 21]. Available from <http://52.207.93.195/wp-content/uploads/deprescribing-pamphlet-2015-ppi.pdf>
- [9] Visual Analogue Scale (VAS). [cited 2019 September 6]. Available from <http://img.medscape.com/article/742/580/VAS.pdf>
- [10] Canadian Association of Gastroenterology. Enhanced Primary Care Pathway: Gastroesophageal Reflux Disease (GERD). 2016. [cited 2019 September 3]. Available from https://www.cagacg.org/images/publications/GERD_Enhanced_Primary_Care_Pathway_July_2016.pdf
- [11] Centre for Effective Practice (CEP). Managing Benzodiazepine Use in Older Adults. 2019. [cited 2019 July 23]. Available from https://cep.health/media/uploaded/CEP_BenzodiazepineTool_2019.pdf
- [12] UpToDate. Proton pump inhibitors: Overview of use and adverse effects in the treatment of acid related disorders. 2019. [cited 2019 August 2].
- [13] Deprescribing. Proton Pump Inhibitor (PPI) Deprescribing Algorithm. [cited 2019 August 10]. Available from https://deprescribing.org/wp-content/uploads/2018/08/ppideprescribingalgorithm_2018_En.pdf
- [14] Ontario Drug Benefit Formulary/Comparative Drug Index. 2019. [cited 2019 August 21]. Available from: <https://www.formulary.health.gov.on.ca/formulary/>
- [15] Ontario Drug Benefit Formulary/Comparative Drug Index. Lansoprazole. [cited 2019 September 4]. Available from: <https://www.formulary.health.gov.on.ca/formulary/results.xhtml?q=Lansoprazole&type=1>
- [16] DynaMed Plus. Gastroesophageal Reflux Disease (GERD). 2018. [cited 2019 August 23].
- [17] UpToDate. Proton pump inhibitors: Overview of use and adverse effects in the treatment of acid related disorders. Table 3 Comparison of drug interactions with proton pump inhibitors. [cited 2019 August 2].
- [18] RxTx. Gastroesophageal Reflux Disease. 2018. [cited 2019 July 19].
- [19] Ness-Jensen E, Hveem K, El-Serag H, Lagergren J. Lifestyle Intervention in Gastroesophageal Reflux Disease. Clin Gastroenterol Hepatol. 2016 Feb;14(2):175-82.
- [20] Dağlı Ü, Kalkan IH. The role of lifestyle changes in gastroesophageal reflux diseases treatment. Turk J Gastroenterol. 2017 Dec;28(Suppl 1):S33-S37.
- [21] Health Link BC. GERD: Controlling Heartburn by Changing Your Habits. 2018. [cited 2019 September 10]. Available from <https://www.healthlinkbc.ca/health-topics/ut1339>
- [22] International Foundation for Gastrointestinal Disorders. Diet Changes for GERD. 2019. [cited 2019 October 23]. Available from <https://www.aboutgerd.org/diet-lifestyle-changes/dietchanges-for-gerd.html>
- [23] Expert opinion
- [24] RxTx. Constipation in Adults. 2018. [cited 2019 July 19].
- [25] Brisebois S, Merati A, Giliberto JP. Proton pump inhibitors: Review of reported risks and controversies. Laryngoscope Investig Otolaryngol. 2018 Oct 19;3(6):457–462.
- [26] Epocrates. Rolaids Extra Strength. 2019. [cited 2019 September 1]. <https://online.epocrates.com/drugs/otcs/636805/Rolaids-Extra-Strength-Adverse-Reactions>
- [27] 2019 American Geriatrics Society (AGS) Beers Criteria Update Expert Panel. American Geriatrics Society 2019 updated AGS Beers Criteria for potentially inappropriate medication use in older adults. J Am Geriatr Soc. 2019;67:674-694.
- [28] RxTx. Diarrhea. 2018. [cited 2019 August 10].
- [29] Leiman DA, Riff BP, Morgan S, Metz DC, Falk GW, French B, Umscheid CA, Lewis JD. Alginate therapy is effective treatment for GERD symptoms: a systematic review and meta-analysis. Dis Esophagus. 2017 May 1;30(5):1-9.
- [30] Deprescribing. Deprescribing Guidelines and Algorithms. 2018. [cited 2019 August 10]. Available from <https://deprescribing.org/resources/deprescribing-guidelines-algorithms/>
- [31] Mungan Z, Pınarbaşı Şimşek B. Which drugs are risk factors for the development of gastroesophageal reflux disease? Turk J Gastroenterol. 2017 Dec;28(Suppl 1):S38-S43.
- [32] Iwakiri K, Kawami N, Sano H, Tanaka Y, Umezawa M, Futagami S, Hoshihara Y, Sakamoto C. The effects of nizatidine on transient lower esophageal sphincter relaxations (TLESRs) and acid reflux in healthy subjects. J Smooth Muscle Res. 2011;47(6):157-66.
- [33] Sakurai K, Nagahara A, Inoue K, Akiyama J, Mabe K, Suzuki J, Habu Y, Araki A, Suzuki T, Satoh K, Nagami H, Harada R, Tano N, Kusaka M, Fujioka Y, Fujimura T, Shigeto N, Oumi T, Miwa J, Miwa H, Fujimoto K, Kinoshita Y, Haruma K. Efficacy of omeprazole, famotidine, mosapride and teprenone in patients with upper gastrointestinal symptoms: an omeprazole-controlled randomized study (J-FOCUS). BMC Gastroenterol. 2012 May 1;12:42.
- [34] Adachi K, Komazawa Y, Mihara T, Azumi T, Fujisawa T, Katsube T, Furuta K, Kinoshita Y. Comparative study of the speed of acid-suppressing effects of oral administration of cimetidine and famotidine. J Gastroenterol Hepatol. 2005 Jul;20(7):1012-5.
- [35] Kobeissy AA, Hashash JG, Jamali FR, Skoury AM, Haddad R, El-Samad S, Ladki R, Aswad R, Soweid AM. A randomized open-label trial of on-demand rabeprazole vs ranitidine for patients with nonerosive reflux disease. World J Gastroenterol. 2012 May 21;18(19):2390-5.
- [36] International Foundation for Gastrointestinal Disorders. Reduce Heartburn by Burning Calories. 2016. [cited 2019 September 3]. Available from <https://www.aboutgerd.org/dietlifestylechanges/reduce-heartburn-by-burning-calories.html>
- [37] RxTx. Osteoporosis. 2017. [cited 2019 August 20].
- [38] Ontario Drug Benefit Formulary/Comparative Drug Index. Omeprazole. [cited 2019 September 4]. Available from: <https://www.formulary.health.gov.on.ca/formulary/results.xhtml?q=Omeprazole&type=1>
- [39] Ontario Drug Benefit Formulary/Comparative Drug Index. Pantoprazole. [cited 2019 September 4]. Available from: <https://www.formulary.health.gov.on.ca/formulary/results.xhtml?q=Pantoprazole&type=1>

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