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Mary H. Bowman

University of San Diego, maryhbowman57@gmail.com

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Use of Peer Led Education to Expedite De-prescribing Proton Pump Inhibitors
for Appropriate Veterans

Mary Hines Bowman, MN, FNP-BC, APRN, DNP Student

University of San Diego

Beyster Institute for Nursing Research

Karen Sue Hoyt, PhD, FNP-C, ENP-C, APRN, FAEN, FAANP, FAAN

Clinical Professor

University of San Diego Philip Hahn School of Nursing

Beyster Institute for Nursing Research

San Diego, California

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Description of the Clinical Problem

Proton pump inhibitors (PPIs) were first used in 1989 and attained regulatory approval to be routinely prescribed in inpatient and outpatient settings as safe for chronic use to prevent ulcers in high risk patients and to treat various gastrointestinal pathologies worldwide (Avraham & Biglow, 2018). Since then, PPIs have been prescribed for long term use as one of the costliest, most widely prescribed medications to treat gastritis, laryngeal symptoms (Gatta, Vaira, Sorrenti, Zucchini, Sam, & Vakil, 2007) and gastroesophageal reflux disease (GERD) (Farrell, Pottie, Wade, Boghossian, Pizolla et al., 2017; Naunton, Peterson, Deeks, Young & Kosari, 2018; Reeve, Andrews, Wiese, Hendrix, Roberts, et al., 2015; Thompson, Black, Welch, Farrell, Bjerre, et al., 2018).

Proton pump inhibitors (PPIs) are currently reported by Avraham and Biglow (2018) to be inappropriately prescribed 48.59% of the time. Reeve et al. (2015) initially reported in 2013 that PPIs were inappropriately prescribed 50% of the time in Australia. In 2017, Thompson, Black, et al. reported from Canada that 50% of patients remain on PPIs long term without need. Haastrup, Paulsen, Christensen, Sondergaard, Hansen and Jarbol (2016) found in a nationwide cohort study of PPIs that between 2001 and 2011 in the United States, new onset of long-term PPI use highly correlated to low income and low educational level, following adjustment for other variables. Of these long-term users, 96% were found to not have a diagnosis indicating a need for PPI therapy (Haastrup, et al., 2016).

High percentages of general long-term PPI use are consistently reported in the evidence. Song, Zu and Lu (2014) cited PPIs as the best drugs to decrease excess acid production and as internationally one of the most regularly prescribed classes of drugs. Pinto-Sanchez, Yuan,

Hassan, Bercik, and Moayyedi (2018) completed a systematic review and found PPIs to be more effective than placebo and prokinetics in treating functional dyspepsia. The efficacy of PPI therapy to treat GERD and laryngopharyngeal reflux may inhibit patient motivation to cease use. Decreases in appropriate use do not support improvement in effective de-prescribing practices for appropriate patients over the course of the past 5-6 years, between publications assessing percentages of inappropriate use in disparate worldwide populations.

Evidence Considerations for De-prescribing or Continuing Long-term PPI Use

Primary care providers (PCPs) have been tasked since about 2014 to de-prescribe use of PPIs for patients taking them for longer than 8 weeks who do not meet exclusion criteria. These criteria include Barrett's esophagitis, tumor or metastasis, mechanical ventilation, hospice or palliative care, radiation therapy, chemotherapy, pathological hypersecretory conditions, use of anticoagulation therapy or variceal or gastrointestinal hemorrhages (Avraham & Biglow, 2018). Patients not meeting Los Angeles Classification Grade C or D gastroesophageal reflux symptoms and with no history of ulcers or disease related pathologic gastropathies may be de-prescribed PPIs after 4 to 8 weeks (Farrell, et al., 2017). Evidence published since 2013 supports de-prescribing patients with no exclusion criteria, to limit comorbidities associated with long term PPI use (Avraham & Biglow, 2018; Gualtero, Abril, Camelo, Sanchez, Davila et al., 2017; Ho, Teng, Yeh, Wang, Yang, et al., 2014; Khan, Ismail, Haider & Ali, 2018; Lazarus, Chen, Wilson, Sang, Chang et al., 2016; Thompson, Black et al., 2017; Xie, Bowe, Li, Xian, Yan et al., 2016).

Mostly only longitudinal observational cohort studies show chronic PPI use associations with risks for developing community acquired pneumonia, clostridium difficile infections, diarrhea, chronic renal insufficiency, headaches, hypocalcemia, osteoporotic fractures, hypomagnesemia, and vitamin B12 deficiency and QT prolongation (Farrell et al., 2017; Khan et

al., 2018; Ho, et al., 2014; Lazarus et al., 2016; Xie et al., 2016). Increased risk for developing gastric tumors and gastric carcinoma in association with long-term PPI use is yet another concern addressed in recent research. Jianu, Fossmark, Viset, Qvigstad, Sordal, Marvik et al., (2012) presented two case studies which showed hypergastrinemia secondary to PPI therapy, concluding that enterochromaffin-like (ECL) carcinoids could arise from long term PPI use, as occurred in the cases they reported. Song, Zhu and Lu (2014) concluded in their systematic review that patients taking PPIs long-term have an increased possibility for experiencing simple or focal ECL hyperplasia, without certainty of the clinical significance or correlation to the development of corpus gastric atrophy, intestinal metaplasia or overall increased risk for the development of pre-cancerous gastric lesions. A case study of iron deficiency anemia was reported as severe in nature, in association with long-term PPI use (Dado, Loesch, & Jaganathan (2017)). A large cohort study of veterans by Xie et al. (2016) cited excess risk of death among PPI users, including those taking PPIs long-term without necessity, compared to those taking histamine receptor agonists (H2RAs).

Many patients take PPIs for years without reasons and are reluctant to stop use (Avraham & Biglow, 2018; Farrell, B. et al., 2017; Naunton, M. et al., 2018; Reeve et al., 2015; Thompson, Black et. al., 2017; Xie, et al., 2016). Thompson, Black et al. (2017) performed a scoping review of seven survey studies, four qualitative studies and one randomized control trial. These researchers found only one study which evaluated patient preferences, with respect to decreasing or ceasing PPI use. They cited that patients prioritized adequate symptom control the most and had anxiety about return of symptoms with medication dose reduction. Further, Thompson, Black et al. noted that patients are willing to discuss the option of continuing PPI use or try to reduce their PPI use, but held divergent attitudes about reduction. Thompson, Black et al. (2017)

cited evidence that decreasing PPI dosing is an individual decision based on each person's preferences. They recommended including patient input into the decisions to change doses. Thompson, Black et. al (2017) cited that many persons were willing to continue PPI use at lowest doses possible for symptom control, rather than completely ceasing use. Lazarus et. al (2016) found in a population-based cohort study that twice daily PPI use was associated with greater risk for chronic kidney disease than once daily long-term use. Economic savings of limiting chronic PPI use correlates to decreases in side effect related costs and medication cost reduction when the medication is taken as needed, without ongoing full dosing (Thompson, Farrell et al., 2017). Naunton et al., (2018) concluded in a review of PPI use between many nations that the medication class is still used without necessity in many situations world-wide, warranting prioritization of more specific de-prescribing efforts.

PCPs are advised by gastroenterologists to de-prescribe patients with no exclusion criteria for cessation after up to 8 weeks of use (Avraham & Biglow, 2018; Farrell, et al., 2017), with minimal guideline support (Avraham & Biglow, 2018; Farrell, et al., 2017; Reeve, et al., 2015). Thompson, Black et al., (2017) cited a plethora of findings exist that few patients require therapeutic care with long term PPI use (2017). De-prescribing constitutes multiple options: sudden abruption, tapering to half dosing and then as needed use or substituting use at the time of de-prescribing with H2Ras to control rebound GERD symptoms (Avraham & Biglow, 2018; Farrell, et al., 2017; Reeve, et al., 2015; Thompson, Black, et al., 2017). Tapering and medication substitution, are supported by the evidence. (Avraham & Biglow, 2018; Farrell, et al., 2017; Reeve, et al., 2015; Thompson, Black, et al., 2017). Regardless, patients do sometimes abruptly cease long term use of PPIs and report symptoms of rebound acid hypersecretion (RAHS).

Evidence does not support abrupt cessation (Farrell, et al., 2017; Naunton et al., 2018; Reeve, et al., 2015; Thompson, Black et al., 2017), as RAHS may inhibit PPI cessation maintenance in de-prescribed long-term users.

Lifestyle and dietary changes have been encouraged to support GERD management. Zolvan, Hu, and Greenberg cited (2017) that prior studies promoting standard reflux precautions have not resulted in decreasing GERD incidence. Lifestyle precautions, such as avoiding heavy late-night meals, intake of spicy foods, high acid containing foods, tobacco, alcohol and caffeine have been promoted by health care providers to reduce GERD symptoms. Such recommendations constitute empirical treatment (Meining & Classen, 2000). Lifestyle and dietary recommendations have not been found in the evidence to play a role in the development, management or progression of GERD, except for in studies with very small numbers of patients (Meining & Classen, 2000). Ness-Jensen, Hveem, El-Serag, and Lagergren (2016) performed a systematic review of the evidence to update lifestyle and dietary recommendations found helpful for GERD symptom management. Weight loss was found to be useful, as reported in two randomized control trials (RCTs), as well as tobacco cessation (Ness-Jensen et al., 2016). Ness-Jensen et al. (2016) also cited that avoidance of late-night meals and elevation of the head at nighttime as effective for managing nocturnally occurring GERD symptoms. Only these four lifestyle changes are supported by updated evidence as effective (Ness-Jensen et al., 2016).

Symptoms of laryngopharangeal reflux have been previously addressed with long-term PPI use (Zolvan, Hu, & Greenberg, 2017). Changing over to a plant based Mediterranean Diet and use of alkaline water with standard reflux precautions was demonstrated in a retrospective cohort study of two treatment cohorts (Level IV evidence) with subjects of a median age of 60,

to be much more effective for limiting symptoms of laryngopharyngeal reflux than long-term PPI use (Zalvan, Hu, & Greenberg, 2017).

PCPs may rely on experience in choosing de-prescribing methods (Thompson, Black et al., 2017). Patients report valuing symptom control and angst about RAHS following PPI cessation (Thompson, Black et al. 2017). Use of de-prescribing guidelines help patients share in decision-making for tapering and cessation in support of better outcomes (Thompson, Black et al. 2017). Prescribers must consider patient values and preferences (Thompson, Black et al., 2017). In a veteran outpatient population in the San Diego Veterans Administration Healthcare System (SDVA), the usual de-prescribing care for appropriate patients is performed by PCPs. PPIs are typically de-prescribed after 4 to 8 weeks of use, per institutional pharmacy recommendations implemented in 2015. Patients are supposed to be advised by PCPs to seek follow up care if their GERD symptoms return. Tapering is recommended, without specification or use of parameters or an evidence-based guideline protocol to direct regimens previously found effective. Substitution with formulary H2RAs, such as famotidine hydrochloride and ranitidine hydrochloride, are suggested as optional for use at the time of de-prescribing.

Up to Date Evidenced-Based PPI De-prescribing Guideline Use vs. Usual Care

Up to date de-prescribing protocols recommend closer provider driven follow up care than is presently offered SDVA veterans. Avraham and Biglow (2018) developed a guideline for PPI de-prescribing by reducing the dose in half every 3 weeks and then changing the frequency to every other day of use over 3 weeks in a pilot study of ten elderly residents de-prescribed in a nursing home. Follow up assessments were recommended by a clinical pharmacist every 3 weeks during de-prescribing, over the course of 12 weeks (Avraham & Biglow, 2018). This guideline

requires four follow up visits or phone call assessments during tapering (Avraham & Biglow, 2018).

Previously, in 2013, Reeve et al. developed a PPI de-prescribing guideline in Australia that was published in 2015. Fifty-seven PPI users were recruited for a feasibility study and six of these users participated and achieved successful cessation of use for minimally 6 months. Tapering was recommended by reducing PPI dosing in half with use of a symptom action plan to add doses as needed or to return to the prior dose taken to alleviate onset of any associated severe RAHS during de-prescribing (Reeve, et al., 2015). Patients tapered with call backs every 2 weeks during de-prescribing (Reeve, et al., 2015). Ten-minute pharmacy led phone call follow up interventions every 2 weeks during 6 weeks of de-prescribing were conducted and additional phone calls made 6 weeks after de-prescribing were completed with subsequent call backs 6 months following de-prescribing, to evaluate for ongoing cessation of use (Reeve, et al., 2015). An average of 4.3 phone calls were made to six participants who were de-prescribed in their feasibility study of use of a guideline (Reeve, et al., 2015). Total time used by health professionals to de-prescribe each patient constituted about 1.5 hours per patient, as presented in their 2013 conference poster (Reeve, et al., 2015).

The usual SDVA Healthcare System de-prescribing care since 2015 is for PCPs to stop ordering PPIs after 8 weeks by tapering the dose and substituting with H2RAs. Very limited specified de-prescribing guidance is offered. Exclusion criteria for de-prescribing is incomplete. Tapering instructions do not include recommendations for follow up to determine efficacy. SDVA PCPs are not specifically guided to seek testing for helicobacter pylori antibodies or to order endoscopies after de-prescribing patients who report ongoing GERD symptoms following de-prescribing failures.

Farrell et al (2017) recommend selection for exclusion of de-prescribing be made for patients known to have Los Angeles (L.A.) Classification C or D GERD, with or without a history of ulcers. Farrell et al. (2017) also recommend in their PPI De-prescribing Guideline that patients be tested for helicobacter pylori antibodies if they initially fail PPI de-prescribing. SDVA PCPs are neither guided to de-prescribe PPIs according to the breadth of multiple exclusion criteria discussed by Avraham and Biglow in their PPI De-prescribing Guideline (2018). Avraham and Biglow's 2018 De-Prescribing Guideline does not incorporate use of the L.A. Classification of GERD in clinical decision-making for exclusion of persons inappropriate to de-prescribe long-term PPI use. Use of the 1999 Los Angeles Classification System of GERD, for assessment prior to de-prescribing, is neither mentioned for use in decision-making to de-prescribe long-term use after 4 to 8 weeks of PPI therapy in the SDVA Healthcare System. Lundell, Dent, Blum, Armstrong, Galmiche, Johnson and Hongo, et al. (1999) and Sami and Rangunath (2012) confirmed that the L.A. Classification of GERD System is still the most widely used tool for classification of severity of GERD.

The 1999 L.A. Classification of Oesophagitis, first developed in 1994, was supported by the World Organization of Gastroenterology after it was first presented at the Los Angeles World Congress of Gastroenterology in 1999. The classification system uses endoscopic findings and circumferential measurements to objectively determine the severity of GERD by enumerating and measuring erosions in mucosal breaks of < or > 5mm in size and the degree of extension of erosions between the tops of two mucosal folds apiece (Lundell, et al., 1999; Sami & Rangunth, 2013). When used in clinical decision-making for de-prescribing, L.A. Classification of GERD may ensure patients with severe GERD are not inappropriately de-prescribed off long-term PPIs. The Farrell et al. 2017 PPI De-Prescribing Guideline, published in Canada, applies the

internationally used L.A. Classification of Oesophagitis, which makes it a preferred guideline. It is supported by objective evidence to determine criteria for use in de-prescribing practices.

Table 1

The 1999 Los Angeles Classification of Oesophagitis

Grade	Description
A	One (or more) mucosal break no longer than 5 mm that does not extend between the tops of two mucosal folds
B	One (or more) mucosal break more than 5 mm long that does not extend between the tops of two mucosal folds
C	One (or more) mucosal break that is continuous between the tops of two or more mucosal folds but which involve less than 75% of the circumference
D	One (or more) mucosal break which involves at least 75% of the esophageal circumference

Note. From “Endoscopic assessment of oesophagitis: Clinical and functional correlates and further validation of the Los Angeles Classification,” by L. R. Lundell, J. Dent, J. R. Bennett, A. L. Blum, D. Armstrong, J. P. Galmiche, . . . L. Wallin, 1999, *Gut*, 45, 172-180. doi:10.1136/gut.45.2.172

No team-driven follow up is standardized for SDVA PCPs to support evaluation for prolonged PPI cessation success in the SDVA. Two patient care instruction sheets were made available by the Department of Pharmacy for PCPs to copy and give to patients in 2015. They cite overutilization of PPIs, associated risks, and recommendations for foods to choose and avoid for management of GERD. Many patients are not re-evaluated until they return for routine care and are found to have continued or resumed taking PPIs, sometimes by purchasing them over the counter (OTC).

Patients report resuming PPIs due to their efficacy, even as risks may outweigh benefits for Many long- term users (Naunton, et al., 2018; Farrell, et al., 2017; Thompson et al., 2017). A primary care (PC) team driven follow up mechanism to reassess patient symptoms at intervals following de-prescribing is supported by newer evidence (Farrell, et al., 2017; Naunton, et al., 2018). Patients who continue to take very costly PPIs after de-prescribing may miss

opportunities to receive timely endoscopies and biopsies, which diagnose helicobacter pylori antibodies, Barrett's esophagitis, or esophageal cancer, which warrant different treatment.

Few patients taking PPIs long term meet criteria for having a history of ulcer and/or grade C or D GERD, which are conditions the evidence supports which would warrant continuing their PPI use (Farrell, et al., 2017). PCPs sometimes abruptly discontinue PPIs, after more than 4 weeks of continuous use. Evidence shows abrupt PPI cessation is less effective than tapering to mitigate rebound acid hypersecretion symptom (RAHS) severity (Naunton, et al., 2018). Persons abruptly ceasing PPI therapy may therefore be understood to be more apt to resume long-term PPI therapy following de-prescribing, as they are more likely to develop severe RAHS following de-prescribing without first tapering use (Boghossian, et al., 2017). Patients may then decide to purchase PPIs over the counter (OTC) to privately manage their own symptoms. Since PPIs became available for purchase OTC years ago, cessation falls into the hands of the patient, who will make lifestyle changes recommended by the evidence or face risks associated with excessively blocking symptoms of acid reflux by continuing use.

Description of EBP Project, Facilitators and Barriers

A more structured and simplified approach to de-prescribing PPIs can improve successful de-prescribing of PPIs in appropriate situations. Implementation of an evidence-based practice (EBP) PPI de-prescribing guideline, developed by a team of experts utilizing grading of recommendations assessment, development and evaluation (GRADE) by a team to guide recommendations for de-prescribing PPIs (Farrell et al., 2016) could be piloted for use in SDVA outpatient primary care settings. A PCP nurse practitioner (NP) peer proposed to educate up to six available on-site PCPs to several guidelines with intentions to reach a group consensus thereafter to translate into use the most practical and carefully established EBP de-prescribing

algorithm. The Farrell et al. (2017) PPI De-prescribing Guideline was developed with specific utilization of GRADE criteria in 2016 in addition to Los Angeles Classification of GERD System criteria, to specify the measurable degrees of GERD severity in patients had who were considered for recommendation to cease long-term PPI use. The 2017 Farrell et al. PPI De-prescribing Guideline was proposed for primary consideration for translation into practice as a preferred guideline to implement for these reasons and for another pragmatic reason. The Farrell et al. PPI De-prescribing Guideline (2017) requires PCP team driven follow up at three intervals: 4 and 12 weeks and 12 months following PPI de-prescribing. It was perceived as more feasible to use with limited staff resources, compared to other guidelines requiring more follow up care call-back interventions. Use of the PPI De-prescribing Guideline developed by Farrell et al. in 2017 could improve outcomes for patient safety with sustained cessation of PPI use in appropriate veteran patients, in preference to continuing no follow up.

Separately, approaching a change in practice at the local level which requires PCP or PCP team driven follow up care, in accordance with use of any of the three new de-prescribing guidelines poses challenges. Primary stake holders (PCPs) may perceive barriers, such as lack of time or a dearth of staff support to change. Peer led education and curbside coaching of PCPs may promote buy-in by provider stakeholders in an outpatient ambulatory care veteran population. A NP colleague practicing on site who educates PCPs how to implement use of a new evidence-based practice (EBP) guideline at provider meetings can be readily available to field questions and troubleshoot arising problems. An on-site NP has an awareness of staff time limitations and can more effectively promote use of the most efficient EBP de-prescribing guideline feasible to implement to improve care by educating PCPs first to multiple guidelines.

Recommendations for preference to use the most practical and precise guideline with less labor-intensive follow-up than would preclude its natural acceptance for adaptation in busy practice settings can help improve clinical practice. Feasibility of guideline use includes consideration of movement from no telephone follow up care to the most reasonable amount of follow up care time to engage stake-holder buy-in without exhaustion. Resistance to change may ensue if repetitive call backs for follow up are perceived as excessive and burdensome in transitioning to use of EBP De-prescribing guideline care from the usual SDVA care, which currently constitutes no follow up phone care pursuant to PPI de-prescribing initiation.

Peer led education, as a strategy to promote improved practice, is supported by evidence. A Level IV longitudinal study showed that mandatory peer to peer consultation used by radiologists reviewing radiology medical management reduces costs by limiting inappropriate use of high cost imaging studies (Ip, Schneider, Seltzer, Smith, Dudley, Menard, & Khorasani, 2013). A separate scoping review of the efficacy of peer-led education to improve patient safety in four separate studies was reviewed for relevance (Walpole, McLachlin & Chen; 2018). A peer to PCPs (MDs and NPs) and to registered nurses (RNs) functioning on teams in primary care (PC) was determined to be similarly capable to promote changes in programs or routine care to improve de-prescribing of PPIs to reduce costs with improved outcomes.

The PPI De-prescribing Guideline this NP peer (author) selected to try to implement into improve practice in this primary care veteran population constitutes Level VII evidence (Farrell, et al., 2017), as it was constructed by a multidisciplinary group of experts in Canada. Its development was based on evidence obtained from few Level I meta-analyses of RCTs (Boghossian, et al., 2017; Gatta et al., 2007) and cohort studies (Avraham & Biglow, 2018; Gualtero et al., 2017; Ho, et al., 2014; Khan, et al., 2018; Lazarus, et al., 2016; Naunton, et al.,

2018; Xie, et al., 2016; Zalvan, et al. 2017). One meta-synthesis (Level VI evidence) was incorporated (Thompson, et al., 2018). The Farrell et al. (2017) Canadian based de-prescribing guideline aims to improve effective PPI de-prescribing with simple and specific tapering instructions and follow up care to mitigate patient safety risks and unnecessary costs associated with PPI de-prescribing failures. GRADE criteria and checklists were used in its development. Its simplicity and specificity lend its optimal use for piloting with consistency in a primary care setting with minimal available team driven follow up phone call care availability. The NP selected guideline of choice was developed to promote and support PCPs beginning to address PPI de-prescribing for patients engaged in unnecessary, long-term use in Canada.

Evidence Based Project Model

The Iowa Model (Melnyk & Fineout-Overholt, 2015) was used for this practice change which was driven by two triggers, new knowledge and the spirit of inquiry. The new knowledge guiding a change in care, de-prescribing PPIs for appropriate patients, is supported primarily by retrospective cohort studies in the evidence. The spirit of inquiry is a separate trigger driven by the PCP trying to configure the best practice means to reach the outcome of effective cessation of use of PPIs for the patients who do not need to take them long term and may be at risk for adverse outcomes on them. De-prescribing PPIs is presently recognized by the Department of Medicine and Department of Pharmacy as a patient safety and cost reduction priority in the SDVA Healthcare System. The Iowa Evidence Based Model was incorporated into this DNP project, as it supports a team approach to problem solving.

Proposed Evidenced-based Solutions, Project Development and Implementation Timelines

To resolve the problem with the usual care, searches were made in CIANHL, Ovid, PubMed and Cochrane data bases of PPI side effects. Level I, II and IV evidence was found

searching key words: “proton pump inhibitors,” and “clostridium difficile causes.” Mostly Level IV evidence was used in support of recommendations to de-prescribe PPIs due to side effects following long term use since some Level II evidence (RCTs) did not reveal sufficient evidence of side effects of use associated with early onset of dementia or gastric cancer. Level IV evidence in large cohort longitudinal and observational studies (Ho, et al., 2014; Lazarus, et al., 2016; Xie et al., 2016; Zalvan et al., 2017) was overall much stronger in support of de-prescribing PPIs. Thirty-three research articles were reviewed. Peer led education and coaching literature was searched for applicability between sites for evidence-based practice changes.

The Five A’s, as originally published by Fiore, Hatsukami, and Baker (2001) for use for tobacco cessation treatment) was located. Use of the Five A’s for patient counseling in separate situations (Glasgow & Miller, 2006) was identified, as the tool was also used by Glasgow and Miller in 2006 to assist with obesity management treatment. A screening tool for team driven follow up assessments, implementing the Five A’s, was considered plausible to develop from its intended format for a proposal to use in a pilot study. A checklist-based questionnaire was developed to evaluate and support patient cessation of PPIs after de-prescribing at 4- and 12-week intervals, consistent with Glasgow & Millers’ 2006 suggestions for practical tracking of sufficient delivery of Glasgow’s Five A’s in QI projects. Fiore, Hatsukami and Baker’s 2001 original Five A’s Tool was identified as a feasible instrument to use to implement follow up of the 2017 Farrell et al. PPI De-prescribing Guideline. PC team-led phone calls could be initiated by PC nursing staff who would address follow up using the Five A’s instrument in a pilot that was proposed to be launched following education of the Canadian PPI De-prescribing Guideline (Farrell, et al., 2017) and competing guidelines. Kirkpatrick’s Four Levels (Kirkpatrick, 1994; Kirkpatrick & Kirkpatrick, 2016) were reviewed in the original format developed by Don

Kirkpatrick (1959) and as published in 1993. The Four Levels, as updated for use by Kirkpatrick's son and daughter in-law (Kirkpatrick & Kirkpatrick, 2016) for training and evaluation were used to measure success of the QI education EBP project. The Four Levels (Kirkpatrick & Kirkpatrick, 2016) was utilized as an instrument to measure the success of peer led training. Specific measurement outcomes to assess the efficacy of the education could be determined by actual PCP behavior changes following education.

Project Approval

This project was approved by the SDVA Departments of Medicine, Pharmacy and Nursing and by the Director of Primary Care and local Medicine Section Chief in the Sorrento Valley Primary Care Clinic (SVOPC), where PCPs were surveyed and educated about the new guideline. A local Medicine Section Chief in Mission Valley Primary Care (MVOPC) also approved for PCPs at this site be given the pretest, without subsequent education of the guideline, for the purpose of collecting input about PCP satisfaction with the usual care from more PCPs than the five PCPs available to be educated in SVOPC. Internal Review Board (IRB) approval was obtained from the SDVA in February 2018. Approvals were requested through separate chains of command. IRB approval from the University of San Diego (USD) was separately completed in March 2018.

Education Implementation to Translate Evidence Based Practice Guideline into Use

Towards a goal of attaining a consensus from PCPs to pilot the new algorithm in PC, a series of steps was used to enhance provider willingness to change from the usual care. This author, a NP peer, proposed to introduce and educate PCPs to the 2017 evidence-based practice (EBP) PPI De-prescribing Guideline developed in Canada (Farrell, et al., 2017) to improve long-term cessation of PPI use for appropriate patients. The NP peer proposed to act as a facilitator to

open discussions at monthly provider meetings about challenges with the usual care and propose use of a new EBP de-prescribing guideline that other PCPs could consider valuable to pilot to improve care, over the course of 3 months. On site peer availability in all phases of education and curb side coaching to expedite use of quality evidence into the translation of clinical care was proposed as a predecessor to support piloting a provider preferred de-prescribing guideline into practice. The goal was to facilitate PCP buy-in to change practice with the support of an onsite NP colleague leading the practice change initiative. PCPs with direct access to a MD or NP PCP peer supporting the practice change would have more access to curb-side conversations to occur when challenges or issues arose between educational sessions that might inhibit PCP buy-in to change care practices. Open access to regular communication was made available. A review of the literature was done and showed support for peer led education to promote practice changes in other settings, such as between radiologists engaged in quality improvement (Ip et al., 2015).

Provider willingness to change de-prescribing care practices was assessed throughout the education project in four process steps. First, a twelve question Likert survey pretest was conducted by the NP to assess the usual care for de-prescribing PPIs at two similar primary care practice sites in the San Diego VA Healthcare System. Fifteen PCPs participated in the survey. Next, peer led education about the 2017 EBP PPI de-prescribing algorithm developed in Canada by a team of five health professionals (one gastroenterologist, one family physician, and three pharmacists) and five nonvoting members was introduced (Farrell et al., 2017). A proposal to change from the usual care to translate guideline use into practice to improve care in an appropriate veteran primary care population was made. Discussions were initiated with five on site PCPs at the SDVA SVOPC PC site at routine monthly provider meetings, over the course of

3-months duration. The five PCPs who participated in peer-led education comprised four board certified internal medicine physicians and one board certified Master's degree prepared NP). Following departmental and VA Healthcare IRB approval to conduct this education evidence-based quality improvement (QI) project, targeted articles selected from a formal review of the literature were shared at each of three monthly-provider meetings; they were introduced by the NP peer PCP (author).

After interest was ascertained at the first meeting, the NP peer electronically sent several select publications to participating PCPs onsite to separately review, in order to garner more understand of the breadth of PCP concerns and questions, which could be addressed prior to and during the second provider meeting. Selected articles discussed side effects of chronic PPI use (Farrell, B. et al., 2017; Nehra, Alexander, Loftus, & Nehra, 2018; Reeve, et al., 2014; Thompson, Black et al., 2017) and problems with PCPs de-prescribing with abrupt cessation, which typically did not result in successful de-prescribing of PPIs for many patients taking them long term without need (Thompson et al., 2017). Education lasted about forty-five minutes at each of three meetings.

In between meetings, three PPI evidence based de-prescribing guidelines (Avraham & Biglow, 2018; Farrell, et al., 2017 & Reeve, et al., 2015) were introduced by electronic mail to PCPs for critical evaluation, to determine which one would best meet the needs of a veteran population to improve de-prescribing care and outcomes. PCPS learned that each of the de-prescribing guidelines introduced to them recommended tapering PPI use prior to cessation and team driven follow up of patients to ascertain cessation maintenance. Supplemental evidence to support tapering used in the development of each guideline was provided with each publication.

The Farrell et al. (2017) PPI De-prescribing Guideline requires the fewest team driven follow ups at 4- and 12-weeks and then at 12 months following PPI de-prescribing. The Avraham and Biglow PPI De-prescribing Guideline (2018) requires symptom questionnaire and stool screening for occult blood be administered to patients who have been de-prescribed PPIs every 3 weeks, over the course of 12 weeks. The Reeve et al. PPI De-Prescribing Guideline (2015) requires interval call backs at every dose reduction (every 2 weeks) and at the end of 6 months to ascertain long term cessation. The total of call backs averaged 4.3 calls per subject participants in their pilot study, pursuant to de-prescribing (Reeve et al., 2018).

SDVA PCPs asked the NP peer leading the education QI project to offer a means to implement the Canadian Farrell et al. 2017 PPI De-prescribing Guideline. PCPs preferred this guideline's use of 1999 L.A. Classification of Oesophagitis criteria and GRADE usage in its development, and its requirement for fewer follow up calls or visits.. Fewer team driven call backs would make implementation possible, without manpower support offered from the Department of Pharmacy for follow up calls to patients during de-prescribing. All callbacks would therefore need to be done by registered nurses (RNs) assigned to PCP teams with support from the Department of Nursing. PCPs asked the NP peer at the 2nd educational meeting to find an EBP tool that RNs could use to support cessation maintenance after tapering at intervals required by the Farrell et al. 2017 De-prescribing Guideline. PCPs cited provider burnout as concurrently being studied at all local VA PC sites, due to extensive system wide nationally driven demands for benchmark satisfaction of opioid de-prescribing and other mandated activities for satisfactory performance measurements. PCPs noted that RN support was already being geared toward these activities and may inhibit RN availability to launch a pilot for guideline required patient call backs to fully implement translation of the guideline at all levels.

During provider education, the NP peer concurrently surveyed registered nurse (RN) interest in participating in a pilot after completion of the education project that would require PCP teams to call patients only at 4- and 12-week intervals following de-prescribing patients off of PPIs. 12 month follow up could be done by PCPs at visits. The Department of Pharmacy had indicated prior to IRB approval that resources were not available to release a pharmacist to perform the call backs for up to fifty veterans if a pilot were later conducted, as up to one hundred call backs or follow up visits could be required. Funding was not available to support pharmacy participation. Seven RNs participated in two separate meetings for the NP peer leading the education to ascertain their willingness to participate in follow up phone calls to veterans. All RNs expressed interest and concurrently cited concerns other nationally driven priorities for care as impeding with their availability to support phone call follow up during work hours.

The RN manager attended the second meeting and expressed concern about extending RN resources to promote implementation of guideline use. She cited organizational prioritization of national benchmark goals teams were required to assist providers to achieve, in order to reach system-wide mandated performance measure satisfaction criteria. Regardless, she supported the QI project for a pilot study if the RNs found a means for feasibility. One RN expressed interest in participating in a pilot on a smaller scale, after work hours, stating she needed to participate in research to advance for promotion to a higher pay grade before retirement. She asked for structured questionnaires to use for follow-up. The nurse manager of the RNs articulated her support for integration of research to improve care. The RN available after hours to make call backs on her own time was supported to participate outside of normal clinic operation hours.

Five A's (2001) based behavior counseling, as represented for modification with measurement by Glasgow, Emont, and Miller in 2006, was introduced to RNs as a tool that could be used at 4 and 12-week follow up intervals by one or more RNs conducting phone calls, following PCP de-prescribing of PPIs..

Glasgow's Five A's Tool (Ask, Advise, Assess, Assist and Arrange), previously used for obesity management follow up counseling (Stewart, Cox, Turer, Lyna, Ostbyte, Tulskey ...Pollak, 2012) and for tobacco cessation counseling (Fiore, Hatsukami & Baker, 2001) was converted for use into two separate checklist-based patient survey questionnaires. The available RN could use the tools to streamline how she would Ask, Advise, Assess, Assist and Arrange for follow up of patients de-prescribed off of their PPIs.. PCPs reviewed the tools they requested the NP peer develop to evaluate patients at the 4-week and 12-week follow up intervals for consistency and practical application. All PCPs indicated interest in utilizing the questionnaires with modifications in the development of a future projected pilot study. The RN available after work hours to participate in a pilot cited feasibility of use of the tool adaptation for interval call backs.

The NP peer (author) cited that perhaps the usual care was partially not resulting in long-term PPI use cessation because patients in the SDVA system were routinely told to follow up themselves if they were not successfully ceasing use of their PPIs after de-prescribing. A concern was that veterans were purchasing PPIs over the counter after de-prescribing, due to their efficacy, instead of reporting recurrence of GERD or RAHS. RAHS could be further evaluated with recommended testing for helicobacter pylori antibodies, and by endoscopies for biopsies and for classification of more serious GERD that might require long term PPI use. Surveillance would occur for patients who sought follow up care or were provided structured

interval follow up care. Properly identified populations of patients with Grade C or D GERD or persons otherwise not meeting other exclusion criteria for ongoing PPI use could be appropriately prescribed long-term PPI use for planning for appropriate surveillance. Periodic surveillance of esophagitis by endoscopies would not be lost to follow up, consistent with specialist recommendations for severe cases, if only appropriate patients were de-prescribed.

The NP peer concurrently assessed for provider acceptance and resistance to changing de-prescribing practices with EBP guideline implementation. One to two articles citing Level I, II and IV, VI and VII evidence supporting de-prescribing of PPIs were introduced every 1 to 2 weeks by electronic mail. Two hard copies of each article were brought and disseminated at each of three education sessions to promote a practice change to improve, as triggered by new knowledge. Discussions actively engaged all five participating PCPs into decision-making to change from the usual care. Immediately after the third education session, the same Likert survey pretest was administered as a post-test to the five PCP participants.

Discussion of Results of Pre and Post-tests and Costs

Most PCPs acknowledged in pretesting that up to one third of their patients were still taking PPIs long term after de-prescribing. Only 2 out of 15 PCPs (13.3%) were frustrated with these results. Regardless, all were willing to implement an EBP guideline to improve care and thirteen out of fifteen (86.6%) supported on site peer led education and coaching to assist with translation of EBP guideline use into practice. Changes in post-test answers revealed that at the SVOPC site coachability increased from five out of seven providers (71.4%) to 100% of the five providers who participated in the education QI project. Between sites, coachability increased from pretest values of 83% to 100% in post-tests. Willingness to change care remained steadfast at 100%, even as 100% of the SVOPC PCPs endorsed experiencing no frustration with the usual

care in post-tests completed at the SVOPC practice site. Tapering behaviors increased from 66.6% to 100% at the SVOPC site. Results lacked statistical power for generalizability as only five of the fifteen surveyed PCPs participated in the post test, which constituted a very small number of providers. Post-test changes from pre-test behaviors are identified in Figure I.

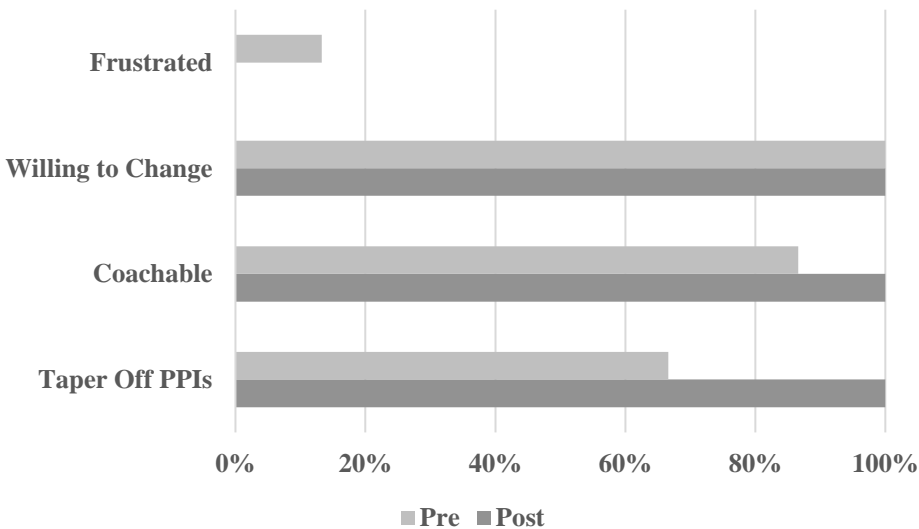


Figure 1. Pre and post survey results and changes as a percentage of total responses.

Qualitatively, the PCPs educated in SVOPC explained that after the education there was some uncertainty as to the value of a pilot launch to try the guideline, reporting they were already attending more attentively to de-prescribing and utilizing tapering strategies. One PCP reported he had tapered himself off long-term PPI use following the education intervention. All PCPs reached 100% consensus following education to pilot use of the preferred 2017 Farrell et al. 2017 PPI De-prescribing Guideline. Costs of the education for four attending internal medicine MD salaries and one NP salary and seven RN salaries were estimated at approximately \$2,000.00 for three 45-minute education-based meetings with PCPs and RNs to change practice. Costs for copying articles to disseminate between providers to take with them at meetings was about \$10.00 (Table 2).

Table 2

Staff Education Cost Analysis

Payroll	Quantity	Rate	Total
RN	7	\$50.00 x 2.5 hours	\$875.00
NP	1	\$70.00 x 2.5 hours	\$175.00
MD	4	\$95.00 x 2.5 hours	\$950.00
Total wages	12		\$2,000.00
Supplies	100 copies	\$0.10 each	<u>\$10.00</u>
Total			\$2,010.00

Savings of organizational costs for renewing long-term PPI prescriptions and out of pocket patient costs for over the counter use were presumed extensive and were not quantifiable within the scope of this project. Separately, costs related to acute care visits for unknown frequency of related cases of clostridium difficile infections, community acquired pneumonia, osteoporotic fractures or treatment for sequelae of micronutrient deficiencies were not possible to quantify within the scope of this project. Projecting costs for prescriptions and acute care visits for side effects attributable to long-term PPI use could easily be much greater than the \$2,010.00 cost of this project, which changed de-prescribing practices to improve care.

Interpretation of Quality of Education Project

The “Four Levels,” established in a dissertation by Donald Kirkpatrick in 1959, have come to be known and expanded upon as the gold standard in the literature for assessing training program efficacy. Walpola, McLachlan, and Chen (2018) used Kirkpatrick’s Four Levels to assess the efficacy of peer-led education in four studies of patient safety education. They

explained education as a necessary means to improve patient safety in healthcare and found all four studies achieved minimally Level II evaluation results and only one study achieved the more challenging Level III and IV evaluations. The Level III and IV evaluations demonstrated actual resulting behavior changes following education and QI initiative development.

Kirkpatrick's Four Levels, as expanded upon by Kirkpatrick and Kirkpatrick (2016), were used to ascertain the quality of this QI project, which aimed to improve patient safety with reduction of long-term PPI use. Level II changes were discovered between pre and post test results, with respect to changes in PCP attitudes and some changes in behavior. A Level III behavior change was specifically cited by a physician who indicated he tapered himself off a long-term PPI he used, subsequent to 3 months of education. Level III evaluations of tapering behaviors changes were revealed in post-tests by PCPs. Several PCPs also provided Level III evaluations of the efficacy of the education and coaching by the NP peer when they explained they might not find ample numbers of subjects still taking PPIs long-term in each of their panels to select to participate in a pilot launch to change practice from the usual care. PCPs indicated that since exposed to and educated about parameters for de-prescribing decision-making and structured tapering options provided in the Canadian PPI De-Prescribing Guideline (Farrell et al., 2017), they (the providers) were already more conscientiously and selectively de-prescribing PPIs. PCPs also cited a provider burnout study was being performed at the same time as this education project and that they were under pressure to answer to multiple nationally driven performance benchmark measures, such as opioid de-prescribing as priorities. VA Nursing staff burnout was also being evaluated in institutional surveys and was reported high in San Diego in 2018. Long-term PPI de-prescribing had not been set as a national VA priority for PCPs for performance improvement at the time the QI project was completed in San Diego.

The NP peer (author) presented a poster with costs for the education and improved de-prescribing results shown via Kirkpatrick's Four Levels with use of the new Canadian PPI De-Prescribing Guideline within 5 months of completion of the education program to all PCP and RN stakeholders. A poster displayed the historical PPI prescribing patterns, problems resulting from long-term use in recent years, and goals for reduction of risks for side effects as driving the need for practice changes. Projected massive cost savings for improved de-prescribing care with team driven follow up were also addressed. Plans to launch a pilot were later abandoned as not feasible at this SDVA clinic. Possibilities for a pilot were considered for follow up at this PC site or at other SDVA sites at a future date.

Project Impact and Sustainability

The impact of NP peer led education to PCPs to change de-prescribing PPI practices in a PC veteran population can lead to an effective pilot of the algorithm at an alternate PC practice site. A pilot can be started at any VA PCP site following repetition of site-specific peer-led education or with approval from the Departments of Medicine, Primary Care, Pharmacy and Nursing following the dissemination of the results of this QI project. Once implementation of the new guideline is piloted, future research can determine if patients get off PPIs more frequently at the end of 12 weeks with team led follow up interventions to assess their progress after de-prescribing. The 2017 Farrell et al. PPI De-prescribing EBP Guideline may eventually be used system wide for VA Healthcare System patients to promote massive improvement in patient safety and cost reductions for the organization, as well as for patients who purchase PPIs over the counter without necessity. PCPs can reassess for cessation at 12 month follow up visits.

Sustainability of this project can be measured by way of establishing promotion of peer-led education for other EBP practice changes in the SDVA Healthcare System by the NP peer

(author). Dissemination of the findings at not only a PCP stakeholder presentation, but also at a quarterly NP retreat, will allow other NPs to learn how EBP guidelines can be integrated into practice by NP peer colleagues leading change, drawing upon their basic nursing education skills. A power point presentation may be led by the NP peer to demonstrate how to develop and measure efficacy of peer led practice changes, which NPs may initiate to lead translation of EBP into clinical practice.

Impact and sustainability may be higher in other organizations that can be educated to PPI de-prescribing guideline use at national poster conferences. Nationally driven oversight of performance measures is predicated for providers in the VA Healthcare System and this prioritization was found to impede EBP changes requiring full interdisciplinary integration of this guideline with call backs to patients. The VA has not cited PPI de-prescribing as a priority in PC clinical reminder reporting for benchmark care satisfaction data analysis. Success of future VA site specific EBP projects may depend on choosing projects which address problems already identified as national clinical priorities. As VA NPs have earned full practice authority (2017), establishing roles to lead translation of EBP into practice becomes very important within the discipline.

Interdisciplinary colleagues may witness advanced practice nurses drawing upon the nursing discipline's strengths to promote translation; NPs may act as expert education facilitators among peer groups, expanding beyond their traditional expertise as educators in direct patient care. NPs may position themselves to become the education experts for translation of EBP into practice. Further, the clinical content value expressed in the power point presentation to NP peers may be utilized and expanded upon by other SDVA NPs practicing as PCPs in other PC settings. SDVA NPs currently work at four other sites outside the SVOPC clinic site, where the project

was conducted. The project's intended goal, to promote effective PPI de-prescribing, may translate beyond the SVOPC site to other sites by NPs who choose to engage in level III practice changes (Kirkpatrick, 1994).

Strengths and Limitations

The education intervention was partly successful, even without a pilot launch, in that PCPs reported higher tapering practice changes found in the evidence to be more successful for long term cessation. This practice change constituted a measurable level III change validating a successful education project (Kirkpatrick & Kirkpatrick, 2016). A major limitation was that PCPs did not have staff support for interval patient callbacks at this site. PCPs reported perceptions of high burnout from addressing other priorities under VA national guideline oversight and cited they were tasked to meet prescribed benchmark clinical reminder satisfaction for opioid de-prescribing and other predetermined measures to uphold as priorities. Implementing EBP guidelines to address changes in practice may take longer in larger systems with more bureaucratic oversight, whereby local clinics do not have the authority to establish newer priorities with limited staff resources.

Conclusion

This NP peer led education project, which informed and coached SDVA PCPs on why and how to use a new EBP de-prescribing guideline, was met with provider willingness to pilot a structured change in practice to promote better outcomes. Naunton et al. (2018) concluded that interventions which show promise for limiting over prescribing of PPIs “include regular medication reviews, facilitated by electronic prompts, and ongoing education of both providers and consumers.” This EBP QI project utilized provider education with regular access to coaching from an on-site peer as combined and simultaneously occurring interventions to limit

inappropriate PPI prescribing practices. Intended outcomes to improve safety and reduce costs were partially met, as some Kirkpatrick (1994) level II and III practice changes occurred.

Provider frustration with the usual care was not a factor found in pre and post-tests to drive willingness to change from the usual care and explore adopting use of an up to date EBP guideline to improve care that would lead patients to expedited sustained cessation of PPI use. A majority of PCPs indicated in pre-tests that they knew many of their patients without a need to take PPIs failed to cease long-term use. In the future, research could be done to qualitatively evaluate the role of factors other than frustration with the usual care, which may promote willingness and openness for practice changes. More patients may complete cessation of unnecessary chronic PPI use and experience fewer side effects and costs associated with long term use following on site education and coaching intervention to support integration of EBP guideline use translation into practice in other settings. Peer-led education and coaching may be considered in other practice situations to promote changes to reduce PCP resistance to change.

Translation of EBP guideline use into clinical practice can be initiated many ways. Barriers to implementation continue to be explored to bridge the chasm of timely research translation into practice. The NP as a PCP-peer holds a position in the dual role of advanced practice RN and PCP to leverage practice changes by promoting and providing education and coaching to both providers and staff RNs. NPs may be best positioned to initiate interdisciplinary practice changes among three professional groups (i.e., MDs, NPs, RNs) serving in peer-educator roles. Careful consideration of priorities which support EBP projects may determine the success of project in larger organizations. Identification of sites which must respond to nationally driven pre-set practice priorities and assessment of the co-existence of PCP burnout prior to starting EBP education projects is essential. Organizations which task providers to first address

benchmark clinical reminders for satisfaction of their performance measurement, in accordance with top-down decision-making standards set at national levels, may present challenges for NPs to promote EBP peer-led education projects to improve care with staff buy-in.

References

- Alexander, S. C., Cox, M. E., Boling Turer, C. L., Lyna, P., Osbyte, T., Tulsy, J. A., . . . Pollak, K. I. (2011). Do the Five A's work when physicians counsel about weight loss? *Family Medicine, 43*, 179-184.
- Avraham, O. & Biglow, M. (2018). Implementation of proton pump inhibitor de-prescription protocol in geriatric residents. *Annals Pharmacotherapy*.
doi:10.1177/1060028018759747
- Boghossian, T., Rashid, J., Thompson, W., Welch, V., Moayyedi, P., Rojas-Fernandez, C., . . . Farrell, B. (2017). De-prescribing versus continuation of chronic proton pump inhibitor use in adults. *Cochrane Database of Systematic Reviews, 3*.
- Dado, D. N., Loesch, E. B., & Jaganathan, S. P. (2017). A case of severe iron deficiency anemia associated with long-term proton pump inhibitor use. *Current Therapeutic Research, 84*, 1-3. doi:10.1016/j.curtheres.2017.01.003
- Farrell, B., Pottie, K., Rojas-Fernandez, C. H., Bjerre, L. M., Thompson, W., & Welch, V. (2016). Methodology for developing deprescribing guidelines: Using evidence and GRADE to guide recommendations for de-prescribing. *PLOS One 11*,1-12. doi:10.1371.
- Farrell, B., Pottie, K., Thompson, W., Boghossian, T., Pizolla, L., Farah, J. R. . . . Moayyedi, P. (2017). De-prescribing proton pump inhibitors. *Canadian Family Physician, 63*, 354-364.
- Fiore, M. C., Hatsukami, D. K., & Baker, T. B. (2001). Effective tobacco dependent treatment. *Journal of the American Medical Association, 288*, 1768-1771.
- Gatta, L., Vaira, D., Soarenti, G., Zucchini, S., Sama, C., & Vakil, N. (2007). Meta-analysis: The efficacy of proton pump inhibitors for laryngeal symptoms attributed to gastro-

- esophageal reflux disease. *Alimentary Pharmacology and Therapeutics*, 25, 385-392.
doi:10.1111/j.1365-2036.2006.03213.x
- Glasgow, R., Emont, S., & Milller, D. (2006). Assessing delivery of the five 'A's for patient centered counseling. *Health Promotion International*, 21(3). doi:10.1093/heapro/dal017.
- Gualtero, S. Abril, L., Camelo, N., Sanchez, S. Davila, F., Arias, G., . . . Pareja, M. (2017). Characteristics of Clostridium difficile infection in a high complexity hospital and report of the circulation of the NAP1/027 hypervirulent strain in Columbia. *Biomedica* 37, 466-472. doi 10.7705/biomedical v37i4.3244.
- Haastrup, P. F., Paulsen, M. S., Christensen, R. D., Sondergaard, J., Hansen, J. M., Jarbol, D. E. (2016). Medical and non-medical predictors of initiating long-term use of proton pump Inhibitors: A nationwide cohort study of first-time users during a 10-year period. *Alimentary Pharmacology and Therapeutics*, 44, 78-87. doi:10.1111/apt.13649
- Ho, S., Tsai, M., Teng, Y., Yeh, Y., Wang, Y., Yang, S., & Yeh, C. (2014). Population-based cohort study on the risk of pneumonia in patients with non-traumatic intracranial hemorrhage who use proton pump inhibitors. *British Medical Journal*, 4(11).
doi:10.1136/bmjopen-2014-006710.
- Ip, I. K., Schneider, L., Seltzer, S., Smith, A., Dudley, J., Menard, A., & Khorasani, R. (2013). Impact of provider-led technology-enabled radiology management program on imaging. *American Journal of Medicine*, 126, 687-92. doi 10.1016/amjmed.2012.11.034
- Jianu, C. S., Fossmark, R., Viset, T., Qvigstad, G., Sordal, O., Marvik, R. & Waldum, H. L. (2012). Gastric carcinoids after long-term use of a proton pump inhibitor. *Alimentary Pharmacology and Therapeutics*, 36, 644-649.

- Khan, Q., Ismail, M., Hiader, I., & Aliz Z. (2018). Prevalence of the risk factors for QT prolongation and associated drug-drug interactions in a cohort of medical inpatients. *Journal of the Formos Medical Association*. doi:10.1016/j.jfma.2018.01.016
- Kirkpatrick, J. D. & W. K. (2016). *Four levels of training evaluation*. Alexandria, VA: ATD Press.
- Kirkpatrick, D. W. (1994). *Evaluating training programs: The four levels*. San Francisco, CA: Berrett-Koehler.
- Lazarus, B., Chen, Y., Wilson, F. P., Sang, Y., Chang, A. R., . . . Grams, M. E. (2016). Proton pump inhibitor use and the risk of chronic kidney disease. *Journal of the American Medical Association Internal Medicine*, 176, 238-246.
- Lundell, L. R., Dent, J. Bennett, J. R., Blum, A. L., Armstrong, D., Galmiche, J. P., . . . Walling, L. (1999). Endoscopic assessment of oesophagitis: Clinical and functional correlates and further validation of the Los Angeles Classification. *Gut*, 45, 172-180.
doi:10.1136/gut.45.2.172.
- Meining, A. & Classen, M. (2000). The role of diet and lifestyle in the pathogenesis and treatment of gastroesophageal reflux disease. *The American Journal of Gastroenterology*, 95, 2692-2697.
- Melnyk, B. & Fineout-Overholt, E. (2015). *Evidence-based practice in nursing & healthcare*. Philadelphia, PA: Wolters Kluwer Health.
- Naunton, M., Peterson, G. M., Deeks, L. Young, H., & Kosari, S. (2018). We have had a gutful: The need for deprescribing proton pump inhibitors. *Journal Clinical Pharmacy Therapeutics*, 43, 65-72. doi:10.1111/jcpt.12613.

- Nehra, A. K, Alexander, J. A., Loftus, C. G, & Nehra, V. (2018). Proton pump inhibitors: Review of emerging concerns. *Mayo Clinic Proceedings*, 93, 240-246.
doi.org/10.1016/j.mayocp.2017.10.022.
- Ness-Jensen, E., Hveem, K, El-Serag, H., & Lagergren, J. (2016). Lifestyle modification for GERD relief: A systemic review. *Clinical Gastroenterology and Hepatology* 14, 175-182.
- Pinto-Sanchez, M. I, Yuan, Y., Hassan, A., Bercik, P., & Moayyedi, P. (2018). Proton pump inhibitors for functional dyspepsia. *The Cochrane Collaboration*, 3. Hoboken, NJ: John Wiley & Sons.
- Reeve, E., Andrews, J. M., Wiese, M. D., Hendrix, I., Roberts, M. S., Shakib, S. (2015). Feasibility of a patient-centered deprescribing process to reduce inappropriate use of proton pump inhibitors. *Annals of Pharmacotherapy*, 49, 29-38.
- Sami, S. S., & Rangunath, K. (2013). The Los Angeles Classification of Gastroesophageal Reflux Disease. *Video Journal and Encyclopedia of GI Endoscopy*. doi.org/10.1016/S2212-0971(13)70046-3
- Song, H., Zhu, J., & Lu, D. (2014). Long-term proton pump inhibitor (PPI) use and the development of gastric pre-malignant lesions (Review). *Cochrane Database of Systematic Reviews*, 12, CD010623.
- Thompson, W., Black, C., Welch, V., Farrell, B., Bjerre, L. M., & Tugwell, P. (2017). Patient Values and preferences surrounding proton pump inhibitor use; a scoping review. *Patient*, 11, 17-28. doi:10.1007/S 40271-017-L0258-4.
- Thompson, W., Farrell, B., Welch, V., Tugwell, P., Bjerre, L. M. (2017). Should I continue taking my acid reflux medication? Design of a pilot before/after study evaluating a

patient decision aid. *Canadian Pharmacists Journal*, 150, 19-23. (ISSN: 1716-1635).

Premedline identifier: 28286589.

Walpola, R. L., McLachlan, A. J., & Chen, T. F. (2018). A scoping review of peer-led education in patient safety training. *American Journal of Pharmaceutical Education*, 82, 6110.

doi:10.5688/ajpe6110

Xie, Y., Bowe, B., Li, T., Xian, H., Yan, Y., & Al-Aly (2016). Risk of death among users of proton pump inhibitors: a longitudinal observational cohort study of United States veterans. *British Medical Journal*, 7(6). doi:10.1136/bmjopen-2016-015735.

Zalvan, C., Hu, S., & Greenberg, B., (2017). A comparison of alkaline water and Mediterranean diet vs. proton pump inhibition for treatment of laryngopharyngeal reflux. *Journal of American Medical Association Otolaryngology-Head & Neck Surgery*.

doi:10.1001/jamaoto.2017.1454