Incorporation of Student Pharmacists into a Proton Pump Inhibitor Deprescribing Telehealth Program for Rural Veterans

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Abstract

***Background**: Proton pump inhibitors (PPIs) are among the most widely prescribed class of medications in the United States. Although effective in the treatment of acid related disease, inappropriate PPI use is prevalent, and long-term PPI use has been associated with adverse effects.*

***Objectives:** This evaluation explores the novelty of a student-pharmacist directed PPI deprescribing telehealth program with the goals of (1) determining whether PPIs are appropriately prescribed in Veterans via remote student-led chart reviews, (2) identifying if a gap exists between urban and rural Veterans prescribed a PPI, and (3) assessing the feasibility of integrating student pharmacists into the PPI deprescribing process utilizing telehealth visits through a pilot study.*

***Methods**: Student pharmacists evaluated PPI appropriateness in Veterans at the William S. Middleton Veterans Hospital. Students collected data via remote chart reviews, compared appropriateness of PPI therapy in rural versus urban Veterans, and conducted a deprescribing pilot call study in rural Veterans with inappropriate PPI indications. Clinical decision-making was agreed upon in collaboration with pharmacist preceptors, however all means of communication with Veterans was performed by student pharmacists.*

***Results:** 51% of Veterans were found to have an inappropriate indication for their PPI, though comparison of inappropriate PPI use in rural versus urban Veterans was not statistically significant (n=170, p-value 0.34). 83% of Veterans agreed to proceed with PPI deprescribing and 71% of Veterans ended the pilot study with at least some degree of PPI dose reduction (n=33).*

***Conclusion:** Inappropriate PPI use among rural and urban Veterans is prevalent, however a significant difference was not observed between the two cohorts. Student pharmacists are capable of successful telehealth deprescribing interventions in collaboration with pharmacists.*

Keywords: student pharmacist, proton pump inhibitors, deprescribing, telehealth, rural Veterans

Background

Proton Pump Inhibitors (PPIs) are among the most widely prescribed class of medications in the United States and are arguably the Proton pump inhibitors (PPIs) are among the most effective form of acid suppression therapy;[1] however, long-term use has been associated with many adverse effects.[2] Consequences of inappropriate long-term PPI use may include increased risk of *Clostridioides difficile* infections, community-acquired pneumonia, dementia, magnesium deficiency, falls and fractures.[3–7] Despite their role in the treatment of acid related disease,[8] PPIs remain on the 2019 American Geriatric Society (AGS) Beers List, a list of medications that are potentially inappropriate for older adults, due to increased risk of infection, bone loss, and fractures.[9]

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While there are clear indications for appropriate long-term PPI use such as Barrett's esophagus, erosive esophagitis, or Zollinger-Ellison syndrome, PPI therapy is not the standard of care for gastroesophageal reflux disease (GERD) or heartburn treatment extending beyond eight weeks. The 2013 Guidelines for the Diagnosis and Management of Gastroesophageal Reflux Disease suggest that PPI therapy should be discontinued once diagnostic testing has ruled out GERD in patients still experiencing refractory reflux symptoms.[10] PPIs may be perceived as a harmless remedy and have historically been used improperly in the setting of over-the-counter (OTC) consumer use, ulcer prophylaxis in low-risk patients, overtreatment of functional dyspepsia, and incorrect diagnosis of an acid-related disorder.[11,12] A study by Rotman and Bishop demonstrated approximately 63% of ambulatory care patients using PPIs do not have an appropriate indication.[13] Inappropriate PPI use has also been demonstrated in other patient populations including hospitalized and geriatric patients, with greater than 50% of hospitalized patients failing to meet proper indications for PPIs.[14,15]

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Inappropriate PPI use is also particularly important to consider for rural Americans, as health disparities such as lower quality of life scores and greater physical health comorbidities are well documented in this patient population. [16–18] It is known that rural Americans are more likely to be older, in poorer health, and face greater financial strain compared to their urban counterparts.[19] Additionally, roughly a quarter of all Veterans living in the United States reside in rural areas.[20] Similar to rural America as a whole, rural Veterans also face barriers such as hospital closures, lower health insurance rates, and limited public transportation that may contribute to disparities in access to care.[20] Inappropriate PPI use has not been extensively studied in rural Veterans; however, PPI therapy has been demonstrated to carry an increased risk of death in U.S. Veterans compared to histamine-2 receptor antagonists (H2RAs), especially with prolonged use.[21] Current literature provides insight into the unique socioeconomic and health challenges rural Veterans face, but also presents a gap regarding PPI use in this population compared to their urban Veteran counterparts.

Pharmacists are medication experts and can assist patients that are on long-term PPI therapy by utilizing chart reviews to identify those without an appropriate indication and aid in successful deprescribing.[22] Clinical Pharmacy Practitioners (CPPs) are Veterans Affairs (VA) pharmacists who are credentialed and privileged as prescribers to modify therapy and coordinate deprescribing of medications.[23] With a current shortage of primary care providers and specialty physicians in rural America, the role of CPPs is being optimized to provide comprehensive chronic disease state management services.[24,25] In addition to CPPs, student pharmacists are well-positioned to assess patients for medication appropriateness and identify medication-related problems.[26] Pharmacists and student pharmacists can offer interventions to reduce long term use of PPIs by incorporating both pharmacologic and non-pharmacologic strategies. Such strategies may include increasing exercise, avoiding triggers, deescalating PPI doses, or incorporating medications with fewer long-term complications and side effects such as antacids or H2RAs.[27,28]

Many studies have assessed PPI use and deprescribing protocols but have not focused on the implementation of student-led telehealth interventions.[29,30] Telepharmacy has the potential to provide greater opportunities for patient consultation and adherence monitoring in medically underserved areas,[31] and pharmacy students, in collaboration with pharmacists, are well-positioned to aid in successful deprescribing services utilizing this model of care. This evaluation considers the integration of student pharmacists in collaboration with CPPs to deprescribe PPIs that are being used inappropriately in rural Veterans. The novelty of implementing student pharmacist telehealth interventions will not only ensure appropriate PPI use through quality patient-centered care, but also offer a cost-effective solution to the additional time required to perform this service. The objectives of this project are to (1) determine whether PPIs are appropriately prescribed in Veterans via remote student-led chart reviews, (2) identify if a gap exists between urban and rural Veterans prescribed a PPI, and (3) assess the efficacy of integrating student pharmacists into the PPI deprescribing process utilizing telehealth visits through a pilot study.

Methods

This project was conducted in phases following three distinct objectives: conducting student-led chart reviews, identifying gaps between rural and urban Veteran PPI use, and piloting PPI deprescribing through student-led telehealth modalities. All phases of the project were completed remotely at the student's place of residence due to the COVID-19 pandemic. Chart reviews were conducted in accordance with the VA PPI Deprescribing Protocol (see Figure 1) to identify Veteran eligibility for PPI deprescribing. The protocol was developed by CPPs at the William S. Middleton Memorial VA Hospital and obtained for this evaluation with their permission. Ultimately, the chart review data was utilized to taper PPIs in a pilot study when rural Veterans lacked an appropriate indication outlined by the VA PPI Deprescribing Protocol. This evaluation was deemed to be a quality improvement project using the UW-Madison Institutional Review Board (IRB) Decision Support Tool and was therefore exempt from IRB review.

Objective 1: Conduct Student-Led Chart Reviews

This evaluation was designed as part of the course series titled Practice Innovations I and II at the University of Wisconsin-Madison (UW-Madison) School of Pharmacy, which aims to position students to conduct novel healthcare projects with an emphasis in rural health. The project team consisted of four third-year doctor of pharmacy students who collaborated with six pharmacist preceptors, including four CPP preceptors and two faculty mentors affiliated with UW-Madison School of Pharmacy. The team conducted remote chart reviews from November 2020 to February 2021 and each student was assigned to their own CPP preceptor. All CPP preceptors were employed by the William S. Middleton Memorial VA Hospital. CPP preceptors co-signed clinical notes, provided written and verbal feedback to students, and approved student interventions during the PPI deprescribing process. Faculty mentors offered support by refining project objectives, answering questions about the research process, and providing feedback to pharmacy students throughout project efforts. In addition to positions in academia, faculty mentors were able to offer insight into the medication use process with backgrounds in either ambulatory care or community practice settings. Students sent email communications to CPP preceptors and faculty mentors to relay progress made each week and next steps for future directions.

Veteran profiles for review were selected from Patient Aligned Care Teams (PACTs) at the William S. Middleton Memorial VA Hospital in Madison, WI. The PACT initiative is a team-based approach to primary care delivery that increases coordination

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of care between primary care practitioners to improve patient outcomes.[32] To be included in this evaluation, Veterans were required to be 18 years of age or older with an active, expired, or on-hold prescription for a PPI (omeprazole, rabeprazole, pantoprazole, or lansoprazole) within the William S. Middleton Memorial VA. A report totaling 1,245 Veterans was generated from four PACT panels using the VA Corporate Warehouse (CDW). Students were assigned to a PACT panel based on their CPP preceptor PACT assignments. Students reviewed the Veteran health records of their assigned PACT in listed order. Rurality of Veterans was determined using Rural-Urban Commuting Area (RUCA) Codes, which are categorized by zip code. RUCA codes take into account population density, urbanization, and daily commuting.[33] A RUCA code of 1 indicates urban, 2 through 9 indicates rural, and greater than 10 indicates highly rural. For the purposes of this evaluation, Veterans were delineated as urban or rural, with rural Veterans residing in areas with RUCA codes greater than 1.

Students were granted remote access to the VA network and utilized the Computerized Patient Record System (CPRS), the VA specific electronic health record, to complete tasks. An orientation was provided by VA pharmacy residents to familiarize students with CPRS and facilitate telehealth interventions. Chart reviews were performed for 170 Veterans in total and were documented using a Microsoft Excel™ spreadsheet formulated and agreed upon by students and preceptors. Students conducted remote chart reviews weekly, based on their own availability, to identify the Veteran's documented PPI indication and determine if the Veteran was eligible for PPI deprescribing. In addition to current dosing regimen, demographic data was obtained during chart reviews and can be found in Table 1. All 170 Veterans reviewed were documented in the chart review spreadsheet regardless of their eligibility for PPI deprescribing. Criteria for PPI deprescribing was met if the Veteran did not have an appropriate long-term indication for PPI use as indicated in the VA PPI Deprescribing Protocol. The student noted the Veteran's eligibility in the chart review spreadsheet. If a Veteran had an appropriate long-term indication for a PPI and did not meet the criteria for deprescribing as supported by the protocol, no further interventions were made. Clinical decision making regarding the need for gastrointestinal (GI) prophylaxis was made on an individual basis in conjunction with CPPs. GI prophylaxis was indicated for patients on anticoagulation with a positive HAS-BLED score or three of the following risk factors: age greater than 65 years, history of an ulcer, high dose NSAIDs, long-term steroids, anticoagulants, or concurrent aspirin use. Students consulted with a CPP preceptor if questions arose throughout the chart review process.

Objective 2: Identifying Gaps Between Rural and Urban Veterans

Each student recorded the chart review data for their assigned PACT(s) on separate spreadsheets, which were later combined into one spreadsheet for composite analysis by a statistician. Data analysis included the percentage of Veterans with an inappropriate PPI indication in both rural and urban populations, the difference between rural and urban populations with an inappropriate PPI indication, and the percentage of Veterans with each PPI indication in each respective population. This phase was carried out from February 2021 to March 2021.

Statistical analyses were conducted using SAS software (SAS Institute Inc., Cary NC), version 9.4 [13]. All reported p-values are two-sided and $p<0.05$ was used to define statistical significance. Descriptive statistics such as mean and standard deviation were calculated for continuous variables and count and frequency were generated for categorical variables. T-tests were used in rural and urban comparison for continuous outcomes, and Chi-square Test or Fisher's exact were used for categorical outcomes.

Objective 3: Pilot Study of a Student-Led, Deprescribing Process Using Telehealth

A pilot study was conducted from March 2021 to May 2021 to test the efficacy of a student-led PPI deprescribing program for Veterans using the VA PPI Deprescribing Protocol. Students were indirectly supervised by CPPs through virtual platforms and made telephone calls to a total of 33 Veterans to gauge interest in participating in the PPI deprescribing process. The pilot call study included only rural Veterans on inappropriate PPI therapy as identified during the chart review process. The VA PPI Deprescribing Protocol was utilized to follow a standardized process for PPI deprescribing. The protocol considered the initial PPI dose and provided stepwise therapy management until the Veteran was completely deprescribed or tolerating the lowest effective dose. The deprescribing process was completed using a four step process for each Veteran encounter: (1) the student attempted initial Veteran contact, (2) the student completed a Veteran interview, (3) the student discussed the encounter and proposed intervention with a CPP preceptor, and (4) the student relayed the plan to the Veteran.

In step one, the student contacted the Veteran at an unscheduled appointment time via a secure telehealth app, Doximity.™ The student coordinated appointment times with their CPP preceptor so that the CPP would be available for any questions and plan verification. If the Veteran did not answer the telephone contact, the student left a scripted voicemail message with the William S. Middleton Memorial VA contact number and directions to reach the Veteran's PACT pharmacist. If the Veteran did not return the call, the student attempted to call the Veteran back in one week. After three telephone contact attempts, no further efforts were made to contact the Veteran. If telephone contact was successful, the student described the project to the Veteran, provided education on the long-term consequences of PPI therapy, and discussed why they qualified for deprescription. If the Veteran declined to participate, the Veteran was excluded from the deprescribing

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pilot study. If the Veteran agreed to the deprescribing process, the student proceeded to step two.

In step two, an interview was performed over the telephone by the student to verify Veteran eligibility for deprescribing. This included confirming with the Veteran that they did not have any appropriate indications outlined by the VA PPI Deprescribing Protocol or any new need for GI prophylaxis. Current PPI dosing was confirmed to guide next steps for the deprescription. The student also discussed elements of Veteran lifestyle including diet, alcohol, and tobacco use and their effects on GERD. After the interview was complete, the student ended the conversation with the Veteran, informed them to expect an additional phone call within fifteen to thirty minutes, and proceeded to step three.

Immediately following step two, students contacted CPP preceptors via video or voice conferencing platforms, such as Microsoft Teams™, to discuss the deprescribing plan. The student presented the case to the CPP preceptor, including pertinent information gathered from the Veteran interview. In conjunction with the CPP preceptor, the student determined the appropriate intervention utilizing the VA PPI Deprescribing Protocol. If the Veteran's diagnosis had to be clarified, the Veteran's Primary Care Physician (PCP) was contacted via secure messaging on CPRS. If the Veteran was currently not taking a PPI, the student received permission to discontinue the PPI prescription from their medication profile.

Step four included a telephone follow-up with the Veteran to discuss the change in PPI therapy and incorporate Veteran feedback into the care plan. This follow-up call was conducted directly after step three on the same day as the initial telephone contact. The student used a standardized documentation note template to document each visit. The template was created by the students using the SOAP note format (subjective, objective, assessment, plan) and approved by the CPP preceptor before the start of the pilot call process. Completed notes were routed to the CPP preceptor to be reviewed and co-signed. The student was able to update the Veteran's medication list in CPRS to reflect any changes that were made.

The student performed additional unscheduled follow-up telephone contacts every two-to-four weeks until the Veteran was completely deprescribed or tolerating the lowest effective PPI dose. Each additional follow-up telephone contact was documented using a similar SOAP note format approved by the CPP preceptors. Tolerability of dose reduction and assessment of rebound acid hypersecretion were discussed during each follow up telephone contact. All means of communication to Veterans were conducted by student pharmacists and documented in CPRS. The data analyzed from the pilot call study included Veteran interest in participation, time spent calling the Veteran by the student pharmacist, and the overall outcome of the PPI deprescribing process.

Results

A total of 170 Veteran charts were reviewed for inappropriate PPI use. Veterans included in this analysis were predominantly male, and most reported their race being white. Baseline demographics can be found in Table 1.

Of the total number of Veteran charts reviewed, 109 were considered to be rural Veterans. In the rural subset, the average age was 69 years old, and the majority of Veterans had a duration of PPI therapy greater than five years (64%). Inappropriate PPI use was seen in 52 (48%) rural Veterans, while appropriate use was seen in 57 (52%) rural Veterans. Of the appropriate indications, most Veterans fell under the other diagnoses (55%) category or GI prophylaxis (23%) category. The remaining number of charts reviewed consisted of 61 urban Veterans. The average age was 67 years old, and the majority of Veterans were taking PPIs for greater than five years (54%). Inappropriate PPI use was seen in 34 (56%) urban Veterans, while appropriate use was seen in 27 (44%) urban Veterans. Of the appropriate indications, most Veterans also fell under the other diagnoses (61%) category or GI prophylaxis (18%) category.

Overall, 50.6% of Veterans were found to have an inappropriate indication for PPI therapy. Classification of PPI indications are illustrated in Table 2. A non-statistically significant difference (p=0.3406) was observed between rural and urban Veterans regarding inappropriate PPI use (Figure 3).

A total of 33 rural Veterans were contacted by phone to engage in PPI deprescribing. Of these, contact was made with 29 (87.9%) Veterans. Out of Veterans who were contacted, 24 (82.8%) were interested in participating in the pilot study, while five (17.2%) were not interested (Figure 3). Of the Veterans interested in the pilot study, 13 (54.1%) discontinued their PPI, four (16.7%) decreased their PPI dose, and seven (29.2%) had no change in their PPI dose at study completion.

Student pharmacists spent almost nine hours total communicating with Veterans. Each visit was an average of 8.2 minutes long, and each Veteran had an average of two visits. Based on an average pharmacist hourly pay of $65, students saved the VA almost $600 through Veteran outreach alone, not considering the documentation process.

Discussion

The purpose of this quality improvement project was to assess the usage of inappropriate PPIs in rural Veterans compared to urban Veterans while exploring the practicality of incorporating student pharmacists into a telehealth PPI deprescribing program. Chart reviews revealed inappropriate PPI indications in over half of Veterans assessed, which indicates that inappropriate PPI usage may be widespread in both urban and rural Veteran populations. As there was not a significant difference in PPI use between rural and urban patients, there is no evidence of variation in PPI therapy between these

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respective populations that would otherwise be attributed to lack of healthcare access.

Appropriate PPI usage may be overlooked when completing annual assessments because GERD symptoms are typically well-controlled on PPIs. Therefore, a patient may not be taken off a PPI after the appropriate length of therapy. This can be concluded from the results showing a significant amount of patients inappropriately on PPIs in both urban and rural settings. The importance of this conclusion is related to the idea that long-term PPI use can cause harmful side effects for patients, thus increasing the incidence of poor health outcomes. Pharmacists play a large role in optimizing medication regimens to prevent adverse outcomes; however, limited patient visit time and healthcare resources can prevent this from happening. Opportunities exist to integrate student pharmacists into population-based medication therapy management roles, such as PPI deprescribing, under the guidance of a clinical pharmacist. Student pharmacists were able to review Veteran charts and make decisions about appropriate PPI use as well as conduct Veteran calls and aid in de-escalation of therapy, all while the clinical pharmacists were performing their daily tasks.

Objective 1: Conduct Student Led Chart Reviews

While outcomes of PPI use in rural Veterans has been assessed, and potential harms such as increased risk of mortality and a statistically significant association with dementia have been elucidated, little has been found on the prevalence of PPI overuse and misuse in rural Veterans compared to urban Veterans.[25,34,35] The percent of Veterans found to be on long-term PPI therapy without an appropriate indication was similar to the results of previous studies that assessed inappropriate PPI use in ambulatory patients.[7] A study from Quinn et al evaluated the indication of PPI therapy in Veterans to determine appropriateness of therapy and implemented a CPP-led PPI de-escalation algorithm, but this data lacked differentiation between rural and urban Veteran populations.[36] The current evaluation is unique because it demonstrates that inappropriate indications for PPI use may be prevalent for both rural and urban Veteran populations, and student pharmacists, in collaboration with CPPs, are well-positioned to aid patients in the deprescribing process.

Objective 2: Identifying Gaps Between Rural and Urban Patients

An unexpected result of this evaluation was the similarity between rural and urban Veterans in terms of inappropriate PPI therapy. Previous studies have found that rural Veterans have less access to primary care in comparison to Veterans in urban areas.[20,31] However, PPIs are widely available over-the-counter and are frequently overprescribed, while deprescribing post-discharge is seldom achieved. Therefore, it is understood that this is not only a medication-related problem that affects urban Americans, but one that afflicts rural Americans as well. [13,25]

Objective 3: Pilot Study of Deprescribing Process Using Telehealth

Lastly, research has previously shown that pharmacists have been successful in performing chart reviews and assessing the appropriateness of long-term PPI therapy,[17,35] but there is a paucity of research that has evaluated the effects of incorporating student-pharmacists into the process. While Hata et al have shown that pharmacy students in their advanced pharmacy practice experience community pharmacy rotations have successfully made medication therapy management (MTM) recommendations, no studies identified by the authors have studied the impact of student pharmacist recommendations in PPI deprescribing specifically.[32,37] From our pilot call study, we conclude that student pharmacists can successfully deprescribe PPIs in patients who are eligible, as over half of the Veterans who were contacted for at least one visit were able to decrease their PPI dose or discontinue completely.

Telepharmacy has been expanding and is expected to continue to grow especially after its increased use during the COVID-19 pandemic. Its utilization has been distinctly important in rural underserved areas, and the potential of this modality of care to increase the involvement of students in clinical pharmacy practice has not been studied before.[37] Not only is telepharmacy a cost-effective means of delivering MTM services, but the involvement of students in this process saves the time of the pharmacist with comparatively minimal cost. Overall, students saved about nine hours of pharmacist time over this process, not including time for documentation, through remote precepting and the use of telepharmacy via CPRS remote access.

Despite successfully identifying inappropriate PPI usage in rural and urban Veterans, there were limitations to this evaluation; the first being a small sample size of patients, which could have contributed to non-significant outcomes. Students received a list of Veterans who were currently taking a PPI from four different PACT panels. Students reviewed Veteran profiles sequentially in the order of the PACT panel list, however, the panels themselves were not randomized. A second limitation occurred during the pilot study process when Veterans were unable to be contacted for follow-up calls after a dose decrease. If these Veterans were able to be contacted, it is possible more Veterans would be able to be fully deprescribed. This evaluation is limited in its external validity, as the total Veteran pool was predominantly white and male. While the population studied may not be generalizable, this evaluation allowed the authors to assess a widespread medication-related problem in the Veteran population.

Ultimately, the success of this project supports the practicality of a student pharmacist-led PPI deprescribing program and informs how students can play an important role in the implementation of best practices in healthcare. Dissemination and Implementation Science (D&I Science) is an emerging field

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of research that focuses on the adoption and maintenance of evidence-based medicine, such as PPI deprescribing, as a best practice in primary care. D&I Science explains that even though primary literature elucidates best practices in healthcare, it can take on average 17 years for these best practices to reach patients. This prompts the need for delivery models that integrate widespread adoption of best practices, such as PPI deprescribing.[38] This project explores such a model through the utilization of pharmacy students and can be replicated at other VA facilities across the United States.

In the future, it would also be beneficial to explore the amount of time a student spends consulting with the CPP as well as the time it took to document the interaction. Further analysis could assess the savings in pharmacist salary by incorporating students into the deprescribing process. This service could also be expanded to include populations other than Veterans, for example, patients discharged from the hospital to improve transitions-of-care with the focus of medication reconciliation. Specifically, pharmacists can ensure that discharge medication orders include a PPI taper that is continued in the outpatient setting. Continued analysis of PPI overuse in rural and urban populations will ensure that healthcare systems and clinics devote adequate resources to mitigate and manage the overprescription of PPI therapy.

Conclusion

The problem of inappropriate PPI usage is prevalent throughout both rural and urban Veterans. This demonstrates the importance of making PPI deprescribing telehealth services a common practice in all areas of the country to reduce the risk of patients suffering from the long-term adverse effects of PPIs. For PPI deprescribing to become a more feasible intervention that does not require additional healthcare resources, student pharmacists should be incorporated into the process. Overall, this study proved that students were able to make important interventions while saving time for the pharmacist. In conclusion, it is not only feasible to incorporate student pharmacists into the PPI deprescribing process, but student pharmacists are capable of implementing successful PPI deprescribing interventions.

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Table 1. Baseline demographics of Veterans meeting inclusion criteria.

Baseline Characteristic		Rural (n=109)	Urban (n=61)	P-value (rural vs. urban)	Total (n=170)
Age (average in years)		69	67	0.3045	68
BMI (average in kg/m²)		32	30	0.0803	31
Race	***White***	96 (88%)	51 (84%)	0.4147	147 (86%)
	African American	4 (4%)	2 (3%)		6 (4%)
	Hispanic or Latino	0 (0%)	2 (3%)		2 (1%)
	Asian American	1 (1%)	0 (0%)		1 (1%)
	Undefined	5 (5%)	5 (8%)		10 (6%)
	Other	3 (3%)	1 (2%)		4 (2%)
Sex	***Male***	108 (99%)	60 (98%)	1.0000	168 (99%)
	Female	1 (1%)	1 (2%)		2 (1%)
Years on PPI	***1-4 years***	39 (36%)	28 (46%)	0.4464	67 (39%)
	5-9 years	27 (25%)	12 (20%)		39 (23%)
	≥10 years	43 (39%)	21 (34%)		64 (38%)
Previously Tried PPI		30 (28%)	17 (28%)	1.0000	47 (28%)
Previously tried calcium salt		14 (13%)	5 (8%)	0.4512	19 (11%)
Previously tried H2RA		30 (28%)	17 (28%)	1.0000	47 (28%)
Tobacco Use		20 (18%)	11 (18%)	1.0000	31 (18%)
Alcohol Use		42 (39%)	23 (38%)	1.0000	65 (38%)
Patients inappropriately on a PPI		52 (48%)	34 (56%)	0.3406	86 (50.6%)

Table 2. PPI indications found in chart reviews

	Rural (n=109)	Urban (n=61)	P-value (Rural vs. Urban)	Total (n=170)
History of gastric, duodenal or idiopathic bleed	6 (6%)	3 (5%)	1.0000	9 (5%)
Esophageal cancer	2 (2%)	0 (0%)	0.5371	2 (1%)
Barrett's esophagus	5 (5%)	6 (10%)	0.2047	11 (6%)
History of esophageal dilation	8 (7%)	4 (7%)	1.0000	12 (7%)
Zollinger-Ellison	0 (0%)	0 (0%)	-	0 (0%)
Dysphagia due to reflux	8 (7%)	4 (7%	1.0000	12 (7%)
Current or recurrent esophageal or peptic ulcer	3 (3%)	1 (2%)	1.0000	4 (2%)
GI prophylaxis[#]	25 (23%)	11 (18%)	0.5582	36 (21%)
Other diagnoses*	60 (55%)	37 (61%)	0.5207	97 (57%)

[#]GI prophylaxis may include patients who are on a blood thinner and have a HAS-BLED score greater than or equal to three, or patients who are on a blood thinner with a presumed high risk of bleeding (i.e. history of bleeding, concurrent aspirin use, etc).

*Of note, GERD or heartburn, history of varices with PPI use for >6 months, and history of GI bleed due to H. pylori infection or NSAIDs with PPI use for >1 year were included in "other diagnoses" but were not deemed to be appropriate indications based on the VA PPI Deprescribing Protocol.. "Other diagnoses" may encompass additional appropriate indications not specified in the protocol.

Figure 1. VA PPI Deprescribing Protocol

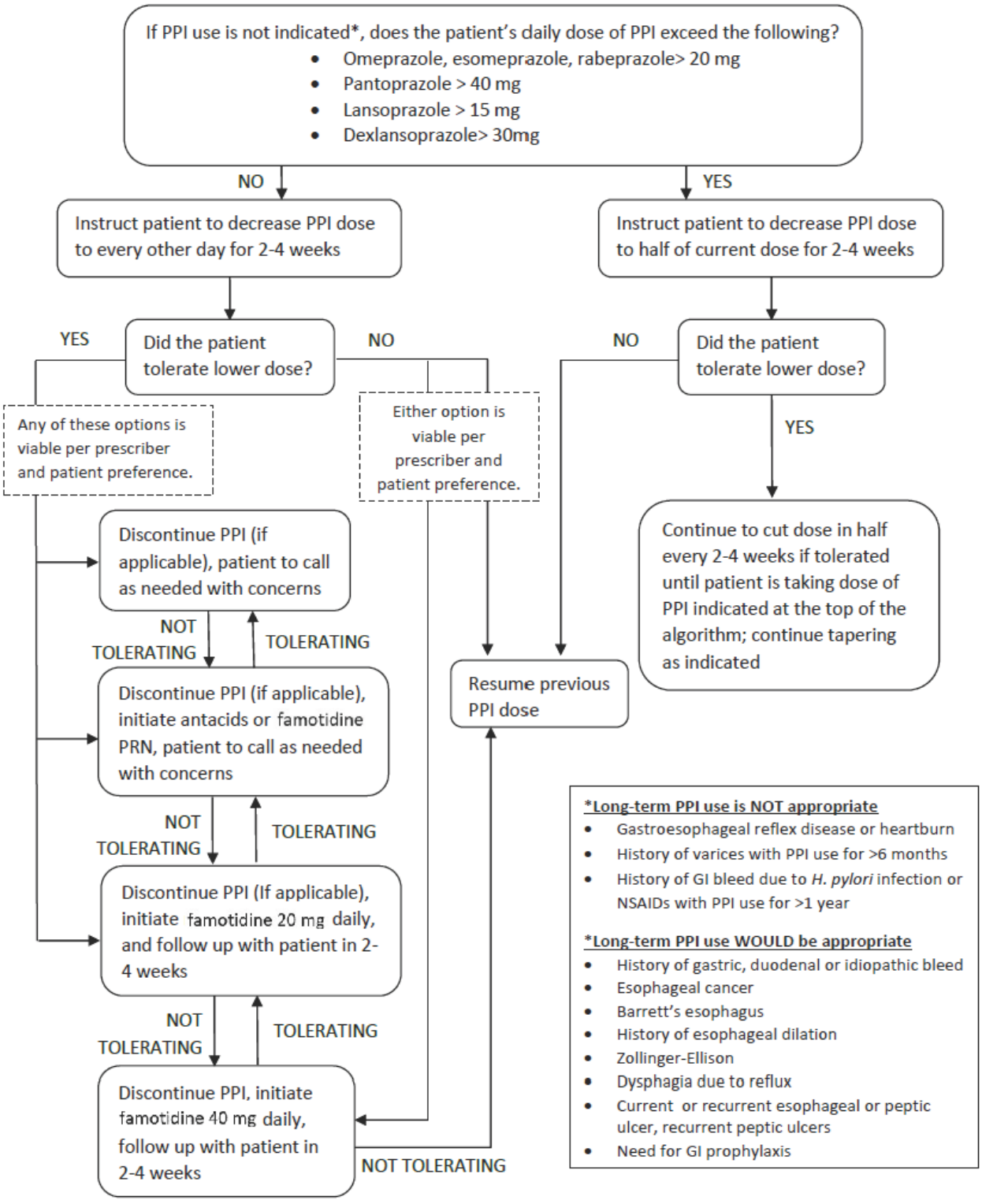


Figure 2. Pilot study telehealth process

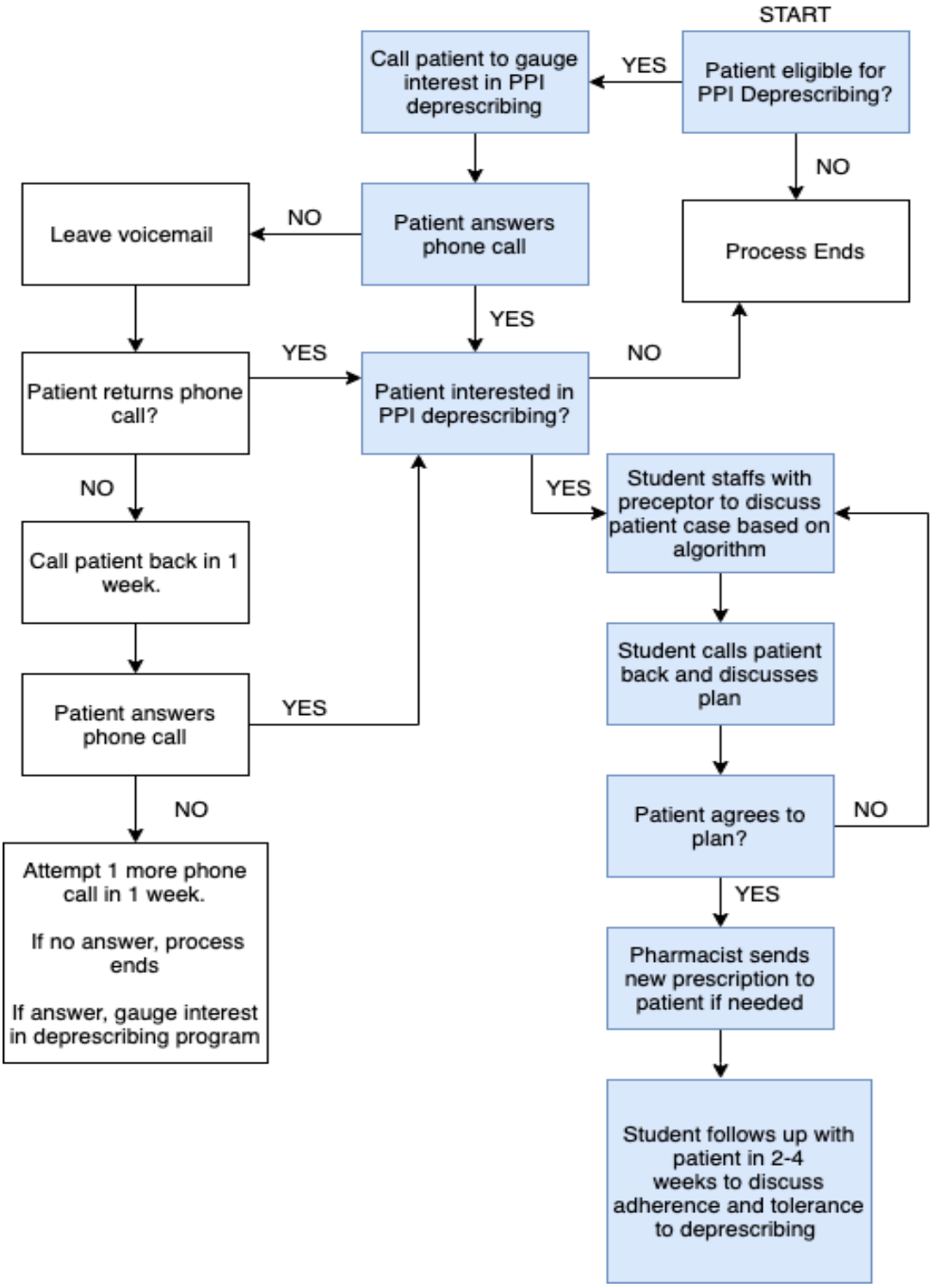
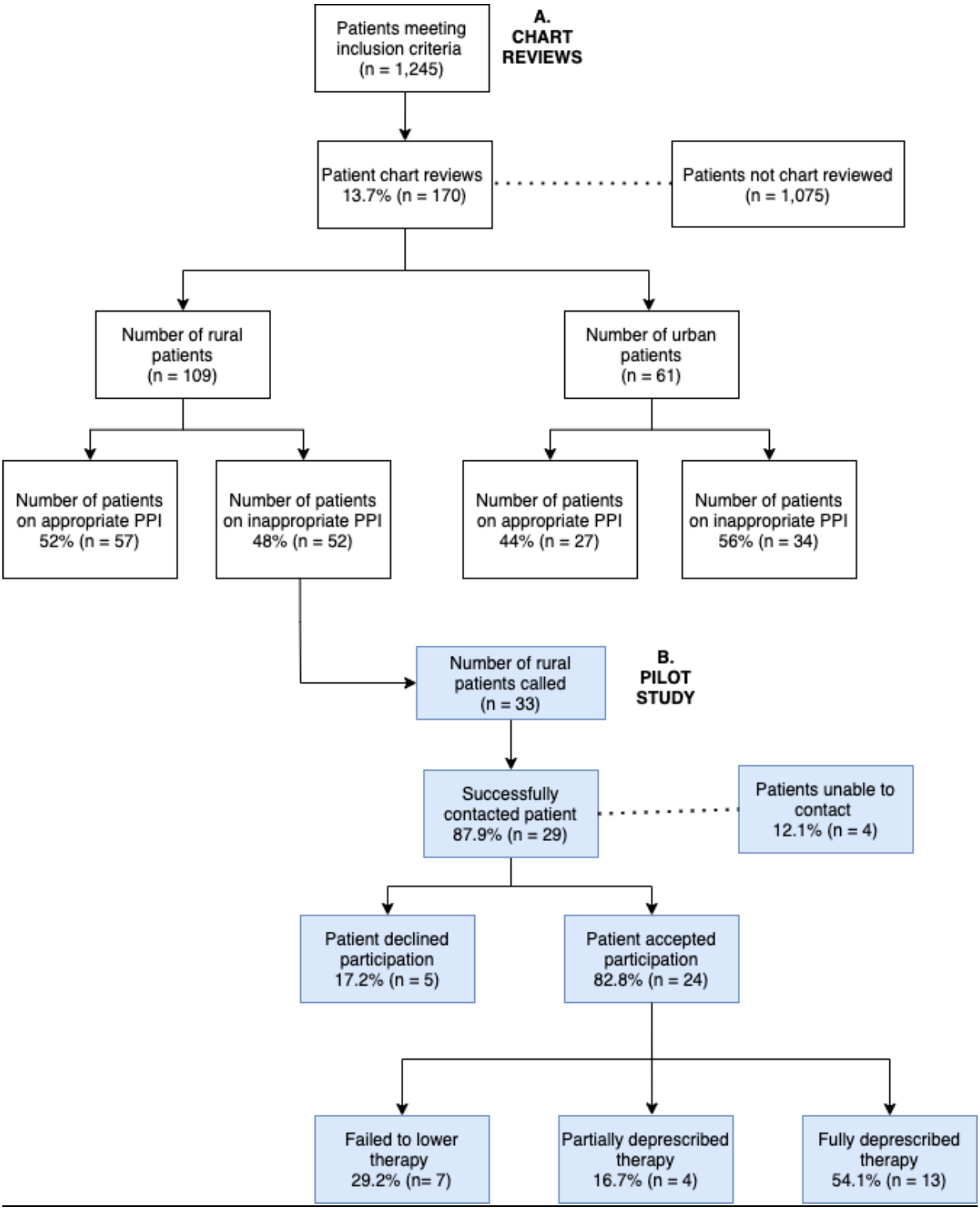


Figure 3. Outcomes based on project flow of events



*Of note, Veterans who were called and were interested in the program but no longer taking a PPI, or those who reported exclusion criteria were included in “failed to lower therapy”.