Provider Adherence to a Point-of-Care Reminder for H. pylori Patient Education

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Abstract

Introduction
Helicobacter pylori (H. pylori) is a bacterium that causes Gastroesophageal Reflux Disease (GERD) and gastric cancer. It has a treatment failure rate higher than 20%. Patient education materials (PEMs) positively affect H. pylori eradication rates and treatment compliance.

Purpose
The purpose of this quality improvement project was to provide PEMs for patients diagnosed with H. pylori at the point of care.

Methods
Fifteen providers in an urban gastroenterology practice were instructed on the use, access, and importance of PEMs for patients diagnosed with H. pylori at the point of care. An in-service provided the instruction and PEMs were added to the electronic health record (EHR) with a point-of-care reminder for provider access. A 14-day pre-intervention and post-intervention chart review was completed to record providers' use of PEMs for patients diagnosed with H. pylori at the point of care.

Results
A paired t-test was conducted with the pre-and post-intervention groups. A statistically significant improvement (p < .001) indicated the number of PEMs post-intervention was significant. Providers' adherence to the point of care reminder for utilization of PEMs was measured at 79.6%.

Discussion
Provider use of PEMs increases in clinical practice when training programs and a point of care reminder are utilized. Additional research is recommended to explore clinical implications.
Conclusion

Adding PEMs to the EHR with a point of care reminder for staff improves provider use of PEMs and can improve the quality of care.

*Keywords*: patient education materials, electronic health record, GERD, point of care, quality of care, Helicobacter.
Provider Adherence to a Point-of-Care Reminder for H. pylori Patient Education

Helicobacter pylori (H. pylori) is a bacterium that causes Gastroesophageal Reflux Disease (GERD). The bacteria are found in the upper GI tract and, if untreated, can lead to ulcers and gastric cancer (American College of Gastroenterology [ACG], n.d.). According to some estimates, H. Pylori infections exist in 50%-75% of the population (Cleveland Clinic, 2023). It is a common diagnosis in clinical practice. It should be treated to decrease the risk of developing chronic Peptic Ulcer Disease (PUD), Gastric cancer, or Mucosa Associated Lymphoid Tissue (MALT-Lymphoma) (Raderer & Kiesewetter, 2021).

Background

The treatment of H. pylori in clinical practice is complex and consists of multiple patient treatment options. These options involve medication regimens comprised of more than one antibiotic with a Proton Pump Inhibitor (PPI) (Hafeez et al., 2021). Treatment failure is multifactorial and can be related to patient compliance, medication tolerance, and inadequate treatment regimens. Treatment failure can be as high as 20% to some estimates (Shah et al., 2022).

Research has shown that patient education can improve the effectiveness of clinical care (Betschart et al., 2019). With more patients using the internet to research medical conditions, patient education materials must be distributed by providers at the point of care to improve the quality of care and avoid misinformation. In addition, researchers have determined that patient education materials positively affect eradication rates and treatment compliance among H. Pylori patients (Zha et al., 2022).

Providers can distribute to patients complete and accurate PEMs via the EHR. However, many providers still need to fully adopt the use of EHR and take advantage of opportunities to
enhance patient education and improve clinical care (Habboush et al., 2018). For example, in 2016, only 60% of office-based physicians had adopted the EHR, compared to approximately 88% in 2022 (Habboush et al., 2018). Despite the increased use of the EHR in clinical practice over the past six years, providers still must optimize its capacity to enhance patient education and improve the quality of care.

Government health agencies have recognized the importance of patient education materials as an essential part of healthcare. For example, in 2011, the Centers for Medicare & Medicaid Services (CMS) introduced a program with financial incentives for healthcare professionals and hospitals to implement, upgrade and demonstrate meaningful use of the electronic health record (EHR). The program outlines specific criteria for providers to reach a patient-specific education core objective as part of the incentive program (Center for Medicare & Medicaid Services, 2023). This requirement can be met by allowing the patient to access information via the portal or by downloading the patient education materials at the point of care.

**Problem Statement**

The project site is an urban gastroenterology practice that performs over 460 procedures weekly and has over 400 office-patient encounters each week. Approximately 15% of the patients are diagnosed or treated for H. pylori at any time. In addition, the EHR contains patient education materials on more than 20 gastroenterology disorders and conditions. Unfortunately, H. pylori patient education materials are not in the EHR despite the long-term consequences of gastric cancer and peptic ulcer disease (ACG, n.d.). The project aims to implement H. pylori PEMs into the EHR that aligns with the current standard for other disorders and provide training for a point of care reminder to utilize these materials for patients.
Organizational GAP Analysis

The clinical site is an urban Gastroenterology practice with a surgical center and satellite offices where advanced practice providers and physicians diagnose and treat over 400 patients weekly. In addition, providers educate patients about common gastroenterology disorders and provide patient education materials about their diagnoses and treatment plans. H. pylori patients are not provided with patient education materials at the point of care because they do not exist in the EHR. Both patients, providers, and other staff have expressed frustration with this deficiency. As a result, patients treated for H. pylori still must seek patient educational materials on their own. H. pylori PEMs should exist in the EHR for staff to access as they do with all other PEMs.

All 15 of the practice’s providers and stakeholders believe PEMs at the point of care are needed and would improve the efficiency of patient encounters as less time would be spent explaining the diagnosis. The support staff believes having these materials at the point of care is long overdue and should be added to the EHR for staff to utilize, as patients frequently request these materials following office visits. The medical director Dr. Velamati stated, “H. pylori patient education materials are needed and would benefit patients with a better understanding of their diagnosis and treatment plan” (personal communication, February 22, 2023).

The practice manager recognized the need for PEMs for patients diagnosed with H. pylori and would also like to comply with CMS’s national quality strategy that was introduced in April 2022 to promote quality outcomes. In addition to the 2011 guidelines introduced by CMS to increase the use of the EHR, the national strategy was introduced to encourage providers to embrace the digital age and promote patient engagement (Centers for Medicare & Medicaid Services, 2022). CMS provides incentives for meaningful use of the EHR (Center for Medicare & Medicaid Services, 2023). Dissemination of PEMs through the EHR is one of the objectives
outlined by CMS within the incentive program. The practice manager sought to improve the quality of care for patients and comply with CMS guidelines. She also believed that this quality improvement project was needed and could lead to future projects exploring the impact of PEMs for patients diagnosed with H. pylori, along with other outcome measures.

**Review of the Literature**

To identify studies related to patient education materials and the treatment of H. pylori, a review of recent relevant studies was conducted using PubMed, Cumulative Index of Nursing Allied Health Literature (CINAHL), Cochrane Library, and Google Scholar databases. Monthly search alerts for research articles were also set up through the National Library of Medicine’s My National Center for Biotechnology Information (NCBI). When sourcing materials, the following search terms were used: patient education materials, quality improvement, quality of care, treatment effectiveness, electronic health record, H. pylori, GERD, and gastroesophageal reflux disease, compliance.

The Boolean operator AND was used to connect these terms to patients and providers in various combinations. The search was limited to peer-reviewed and full-text journal articles in English published in the last five years. Articles were excluded if they did contain subject matter regarding H. pylori or patient education materials. A limited number of articles existed on the specific subject matter of H. pylori and PEMs. As a result, the search was expanded to include the broader topic of PEMs in clinical practice.

The search generated 156 results, with CINAHL producing 114, PubMed 6, Cochrane Library 1, and Google Scholar with 30 results. A forty-five-day search alert from My NCBI produced a total of 5 results. A total of 7 articles were chosen for the final review and divided
into three categories: PEMs in the EHR, PEMs, and H. pylori treatment. The articles reviewed included research studies and meta-analyses.

Lack of PEMs at the point of care for patients diagnosed with H. pylori impacts patients differently. Research has shown that PEMs impact medication compliance, patient management, and treatment outcomes. The literature supports the importance of staff adherence to providing PEMs to patients through utilizing the EHR.

**PEMs**

PEMs are used in clinical practice and can affect healthcare outcomes. The authors of one study focused on PEMs and their effect on professional practice and healthcare outcomes (Giguère et al., 2020). Conducting a meta-analysis, the authors used data from 84 studies. The criteria for the meta-analysis included randomized controlled trials that evaluated the impact of PEMs with three comparisons: (a) PEM versus no intervention, (b) PEM versus a single intervention, and (c) multifactorial interventions where PEMs were included. The study’s conclusion found that PEMs improved patient outcomes. However, the impact of PEMs on patient outcomes was reported to be multifactorial and difficult to quantify, highlighting the need for further research in this area.

Another study sought to improve management for patients diagnosed with H. pylori among primary care physicians with targeted educational intervention (Boltin, 2018). A questionnaire was sent to over 2000 primary care physicians (PCPs) between June 2015 and June 2018. Three interventions were performed for the providers and consisted of printed materials, educational outreach visits, and education over social media platforms. These interventions aimed to improve the PCP’s compliance with H. pylori treatment guidelines and improve patient outcomes. PEMs regarding the implications of H. pylori infection and treatment were provided
to PCPs as part of this intervention. The study's findings found that PEMs should be provided to patients to comply with H. pylori management guidelines as they positively affect compliance. It also concluded that interventions directed at PCPs improved adherence to treatment guidelines. The significance of these findings is teaching can impact provider behavior and this impacts patient outcomes.

Although both studies evaluated using PEMs to improve patient outcomes, the results were accomplished by evaluating different models. (Boltin, 2018) used a quasi-experimental model to focus on improving PCP compliance with treatment guidelines. This study directed PEMs at PCPs and patients to improve treatment outcomes. In contrast, (Giguère et al., 2020) only evaluated randomized controlled trials to evaluate PEMs on three comparisons ranging from PEMs vs. no intervention vs. one or more interventions. Unlike the study involving randomized controlled trials that focused on both providers and patients, this study was directed at patients. The study concluded that compared to other interventions and no interventions, PEMs improve patient outcomes, but the authors suggested this could involve other factors that require further investigation.

**H. Pylori Treatment**

Few studies explored the relationship between H. pylori and PEMs. Zha et al. (2022) conducted a study that focused on the effects of enhanced patient education on H. pylori infection. The author conducted a meta-analysis of over 1,400 patients and concluded that patient education programs were highly effective when treating H. pylori, as they improved eradication rates and compliance. The author summarized their study findings by reporting that patient education is cost-effective, safe, convenient, and complements clinical treatment regimens.
Matsumoto et al. (2019) also examined patients treated for H. pylori and discussed the importance of patient education materials. The authors reported that because antimicrobial therapy can promote different patient experiences, such as intolerance and drug allergies, it is imperative to include strong educational materials so that patients can receive complete and accurate information regarding potential and expected side effects (Matsumoto et al., 2019). One of the authors’ recommendations was that providers utilize patient education materials to help patients understand the importance of completing antibiotic treatment.

Howden et al. (2022) conducted a study that surveyed 251 physicians and 77 patients to determine the reasons for H. pylori treatment failure. The survey measured both physician and patient attitudes to treatment goals. The study determined that only 63.7% of gastroenterologists were concerned about decreasing eradication rates for patients diagnosed with H. pylori. At the same time, only 44.2% of patients understood the implications of H. pylori on their long-term health (Howden et al., 2022).

Each study focused on different factors that impact H. pylori eradication. Zha et al. (2022) focused on the effects of enhanced patient education on patient eradication rates. It only focused on the availability of PEMs and their correlation to eradication rates. In contrast, Matsumoto et al. (2019) focused on how patient education materials related specifically to medication compliance for patients being treated for H. pylori. In comparison, Howden et al. (2022) used surveys to understand physicians’ and patients’ attitudes regarding H. pylori treatment. The three different research studies resulted in findings that noted improvement in patient outcomes and treatment attitudes with the addition of PEMs.
Provider Point-of-Care Patient Education

Patient education at the point of care can improve patient treatment compliance and provider experience. Shah et al. (2022) explored patient experiences associated with H. pylori management. Specifically, the authors wanted to determine the factors that led to patients’ negative treatment experiences and adherence to prescribed antibiotic regimes. Phone interviews were conducted with patients to identify themes within a structured behavioral framework. Results determined that patients’ experiences with H. pylori management were predominantly negative.

Patients identified insufficient education and guidance from their providers as one of the main reasons for their negative treatment experience. The authors noted that one main finding was that H. pylori therapy is most influenced by patient-provider interaction, including explaining the consequences of an untreated infection, the benefits of treatment, and the expected side effects. The study participants unanimously expressed a desire to have more education regarding their condition, treatment, and implications by their provider at the time of diagnosis.

In another study regarding point-of-care reminders for providers, researchers wanted to evaluate the effectiveness of electronic point-of-care reminders vs. monthly reminders to improve provider adherence to clinical recommendations (Coma et al., 2019). The authors performed an unblinded cluster randomized clinical trial to compare two groups of providers. The control group of providers received only monthly feedback, while the intervention group received monthly reminders and on-screen point-of-care reminders for ten clinical conditions. The study showed that electronic point-of-care reminders were more effective than the monthly feedback system.
The two studies provided information helpful with improving clinical practice at the point of care. Shah et al. (2022) focused more on direct provider point-of-care patient interactions and patient experiences related to H. pylori medication treatment experience. It determined the lack of point of care PEMs negatively impacted the patient treatment experience. In contrast, (Coma et al., 2019) study focused on electronic provider point-of-care reminders to improve provider adherence to patient education. Both studies’ results support the benefits of point-of-care patient education, with each exploring it from two different perspectives.

Literature regarding point-of-care reminders for provider adherence to PEMs provided helpful information to guide the QI project (Coma et al., 2019). The review provided research evidence that supports the benefits of PEMs for patients diagnosed with H. pylori. The literature review was challenging as little research existed on the specific topic of PEMs for patients diagnosed with H. pylori. More was available on the general topic of PEMs. Nevertheless, the literature confirmed that adding PEMs into clinical practice improves patient outcomes.

**Evidence-Based Practice: Verification of Chosen Option**

The literature review provided extensive evidence of the benefits of PEMs in improving the quality of care. Research confirms that patient education can improve the effectiveness of clinical care (Betschart et al., 2019). Patient education materials positively affect eradication rates and treatment compliance among patients diagnosed with H. pylori (Zha et al., 2022). Even though studies reported the benefits of PEMs for patients diagnosed with H. pylori, the lack of studies highlights the need for the project. The Quality Improvement project site lacked H. pylori PEMs in the EHR, further verifying the need for the evidence-based project to improve provider adherence to the use of PEMs for patients diagnosed with H. pylori.
The PICOT question for this project was: (P) For providers in an urban gastroenterology practice (I) does the addition of PEMs for H. pylori, along with education & training regarding their significance and use (C) compare with no intervention (O) improve adherence to a point of care reminder for the use H. pylori education PEMs (T) after two weeks post-intervention.

**Theoretical Framework/Evidence-Based Practice Model**

The Iowa Model Revised of Evidence-Based Practice to Promote Excellence in Healthcare (Iowa Model) is the theoretical framework that guided the QI project. The Iowa Model encourages clinicians to identify questions as opportunities to improve practice and healthcare (Melnyk, Mazurek & Fineout-Overholt, 2018). The Model’s initial steps require clinicians to identify triggers that highlight improvement opportunities that compel clinicians to question current practice standards. The triggers identified in the QI project were the lack of PEMs for patients diagnosed with H. pylori and the stakeholder's concern regarding this deficiency in clinical practice.

The Iowa Model provides guidance and a framework for clinicians to make decisions about clinical and administrative practices that affect healthcare outcomes (Melnyk, Mazurek & Fineout-Overholt, 2018). Since its development by the University of Iowa Hospitals and Clinics in the early 1990s, it has been revised and updated to improve its application. The most recent update was in 2017, and The Iowa Model Revised: *Evidence-Based Practice to Promote Excellence in Healthcare* was introduced. One of the main reasons for its revision was to place more emphasis on patient engagement (The University of Iowa Hospitals & Clinics, n.d.).

Implementing the model required steps to design a process for practice change. These steps involved forming a team, analyzing evidence, determining the purpose of the process, developing a practice change design, and devising a plan to sustain the change. After
implementing and evaluating the change, the results should be disseminated to staff. The team for this QI project consisted of the author, the medical director, practice providers, support staff, and the Information Technology (IT) manager.

A question provided the opportunity to improve clinical practice and was the first step in applying the Iowa Model. The question for the QI project was, why don't providers have access to PEMs at the point of care for patients diagnosed with H. pylori? The organization lacked these materials for a patient diagnosed with H. pylori, despite constituting about 15% of the patient population. This deficiency impacted the quality of care and did not promote excellence in healthcare. The literature supports the importance of provider access to PEMs for patients diagnosed with H. pylori.

Following the literature review that supported the need for this QI project, a team was formed to review the supporting evidence and design a plan for practice change. The team consisted of the principal investigator, the practice manager, providers, the medical director, and the IT manager. A consensus of both providers and stakeholders confirmed that the project goals were essential to improve the quality of care.

This information provided the initial evidence to support a pilot project to promote practice change. A draft of the project was reviewed by the practice manager, the medical director, and the IT director. Support staff and stakeholders were asked to provide input to the proposed project. Following this process, the project's pilot for practice change was designed. The pilot involved planning the steps required to implement the project and deciding if the change was appropriate for the practice.

The project was implemented over 31 days with a pre-intervention chart review followed by provider teaching. Then PEMs were added to the EHR with a point of care reminder for
providers to access PEMs for patients diagnosed with H. pylori. Later, a post-intervention chart review was conducted to determine the number of providers accessing PEMs through the EHR for patients diagnosed with H. pylori.

The Iowa Model's final steps were integrated to sustain the practice change by analyzing and disseminating results (Melnyk, Mazurek & Fineout-Overholt, 2018). The point of care reminders for providers to access PEMs for patients diagnosed with H. Pylori were seamlessly integrated into the outpatient protocol following provider training and the help of the IT manager. Given this fact, the sustainability of the practice change is expected to be reliable and continual. Data analysis of the project with results was provided to the staff in a summary report. A diagram of the Iowa Model is presented in Appendix A.

Goal and Objective

The primary objectives of the QI project were the addition of PEMs to the EHR for patients diagnosed with H. Pylori and to measure provider adherence to a point of care reminder for the use of the PEMs. The goal of the QI project was that 80% of patients diagnosed with H. pylori receive PEMs from providers at the point of care.

Settings Facilitators and Barriers

The facilitators identified at the project site were providers and support staff. Both expressed concern about needing PEMs for patients diagnosed with H. pylori. The staff’s willingness to participate in implementing a project to promote policy and practice change was instrumental in completing the project. Another important facilitator was the IT manager's willingness and ability to add PEMs to the EHR with a point of care reminder for providers. Barriers and factors that impacted the implementation of the project were provider habits that were overcome by providing reminders to ensure the use of PEMs at the point of care. Another
barrier was that the IT manager was difficult to contact during the implementation process as he works remotely. This caused a delay in adding PEMs to the EHR and was overcome by regular phone communication with the IT manager. The EHR platform was inefficient for chart reviews. A detailed discussion of this issue is in the interpretation/discussion section.

Methods

A provider’s ability to provide comprehensive care to patients diagnosed with H. pylori in an outpatient setting requires access to all tools to improve patient management. Patient education materials at the point of care for providers did not exist at the project site for this population of patients, even though they encompass over 15% of the office’s diagnosis and its potential for gastric cancer. Patients relied on the internet or other sources to obtain their diagnosis and treatment plan information. Staff, providers, patients, and stakeholders expressed the need for these materials to educate patients and improve efficiency.

Patient education materials for patients diagnosed with H. pylori have been shown to improve patient treatment outcomes and compliance with medication regimes. Staff’s ability to provide patients with reliable information that helps patients understand the diagnosis, treatment plan, and consequences of treatment compliance is important. A point of care reminder to prompt providers to disseminate PEMs to patients improved patient engagement and the quality of care.

The project was implemented over a 31-day period following IRB approval. Consent was waived for providers as the project involved chart reviews of existing data. The initial phase of the project consisted of a 14-day pre-implementation chart review. The chart review recorded the number of patients diagnosed with H. pylori seen by each provider. It also recorded the number of patients diagnosed with H. pylori who received PEMs at the point of care. The provider’s
charts were coded alphabetically and without any identifying patient information. The data was recorded as described in the data collection procedures section.

The second part of the project commenced following the initial phase and consisted of creating PEMs for patients diagnosed with H. pylori. The PEMs were created with input from the medical director, providers, and support staff. The Agency for Healthcare Research and Quality’s (AHRQ) Patient Education Materials Assessment Tool (PEMAT) was applied to assess the understandability and actionability of the PEMs (Agency for Healthcare Research and Quality [AHRQ], 2020). The second part of the project also consisted of an in-service by the principal investigator to providers on the importance of providing PEMs to patients diagnosed with H. pylori. Instructions were also given to access materials at the point of care in the EHR.

The final part of the project occurred over a 14-day period. PEMs were added to the EHR with a point of care reminder for providers to access. Following the addition to the EHR, a chart review was completed to determine the number of patients seen by each provider diagnosed with H. pylori. The chart review also recorded the number of patients who received PEMs at the point of care by each provider. Data was collected and analyzed as outlined in the data analysis section. A detailed description of the project timeframe is presented in the timeline section.

**Project Design**

The project design consisted of a pre-and post-intervention design with pre-implementation and post-implementation chart reviews to measure the effectiveness of the intervention.

**Project Site and Population**

The project site was a gastroenterology practice located in Annapolis, Maryland that includes a procedure suite and five satellite offices. It provides care to patients that range in age
from teenagers to the elderly. Services provided at the practice include managing and diagnosing common gastroenterology disorders. These include but are not limited to Crohn’s disease, Ulcerative colitis, Cirrhosis, Hepatitis C, Hepatitis B, Helicobacter pylori, Barrett’s esophagus, Motility disorders, IBS, Biliary disorders, and iron deficient anemia.

Providers in the practice participated in an in-service for the project. The providers range in age from 27-63. The educational level of providers consists of a bachelor-prepared physician assistant, five master-prepared nurse practitioners, and nine physicians with medical degrees. All the providers are English-speaking and United States Citizens. The years of experience of providers ranged from six months to twenty years.

The in-service took place at the project site. The principal investigator provided each provider with a copy of the project abstract and provided an overview of the project plan. Inclusion criteria included advanced practice providers and medical doctors who diagnose and manage patients in an outpatient setting. Exclusion criteria were providers who did not practice more than thirty hours a week and did not see outpatients at the project site.

The practice serves the Mid-Atlantic region of Anne Arundel County, which has a total population of over 582,000 residents. The race and ethnical demographics are 67.4% White non-Hispanic, 18.4% Black non-Hispanic, 8.6% Hispanic, 4.9% Asian non-Hispanic, and 0.03% Indigenous non-Hispanic. The average life expectancy in the county is 79 years, with the leading causes of death being heart disease, followed by cancer (Anne Arundel County Department of Health, 2022). The county's median household income is $103,225 with 5.7% of the county's residents below the poverty level. 88.5% hold a high school degree or higher level of education.

Measurement Instruments
The principal investigator conducted a 14-day pre-implementation chart review of the EHR to record the number of patients seen by each provider diagnosed with H. pylori pre-intervention. This data was recorded on Google Sheets and included the number of patients who received PEMs from each provider. A chart review of the EHR 14 days post-intervention occurred to record the number of patients diagnosed with H. pylori. The chart review also recorded the number of patients diagnosed with H. pylori who received PEMs from each provider at the point of care. The data was recorded on Google Sheets. AHRQ’s PEMAT tool was used to assess the PEMs for understandability prior to implementation into the EHR. A copy of the PEMAT tool is presented in Appendix B. A copy of the PEM is presented in Appendix C.

Data Collection Procedure

The project commenced on June 2, 2023, with the principal investigator obtaining data from the EHR through a 14-day pre-implementation chart review to determine the number of patients diagnosed with H. pylori. The charts were further reviewed to determine the number of patients who received PEMs at the point of care by each provider. An in-service was scheduled, and provider demographic information was gathered and recorded from the in-service sign-up sheet. The demographic information included gender, training, and years of professional experience. A copy of the in-service sign-up sheet is presented in Appendix D.

Following the in-service to instruct providers on the use, access, and importance of PEMs for patients diagnosed with H. pylori, PEMs were added to the EHR with a point of care reminder on June 9, 2023. A 14-day chart review of the EHR was completed after adding PEMs to determine the number of patients diagnosed with H. pylori. The chart review also recorded the number of providers who accessed PEMs at the point of care for patients diagnosed with H.
pylori. Charts of outpatient encounters from June 12 to June 29 were included. No patient encounters occurred on weekends, and the reviews excluded these dates.

Only signed charts of providers were included in the review with a diagnosis code for H. pylori. Provider charts were excluded from the review if they were unsigned without a diagnosis code of H. pylori. A copy of the chart review flowchart is presented in Appendix E. All data was recorded on Google Sheets.

**Data Analysis**

Data collected and recorded on Google Sheets was uploaded and analyzed using software from Intellectus Statistics (IS) (Stemock & Kerns, 2019). A paired *t*-test was conducted to determine if a statistically significant difference existed between the pre-implementation and post-implementation chart reviews of providers. A One-Way ANOVA and MANOVA were also conducted to determine if a difference of characteristics had any measurable effect on the project’s outcome. Demographic statistics from providers were prepared from data gathered from the provider in-service sign-up sheet. This included providers’ gender, training, and years of professional experience. All provider information was alphabetically coded without identifying information.

**Cost-Benefit Analysis/Budget**

H. Pylori infections cost society over 5 billion dollars and can cause chronic digestive disorders that negatively impact clinical costs (Shah et al., 2022). Lack of patient knowledge regarding the infection and consequences of poor treatment compliance is one of the factors that researchers have identified as a significant issue. Adding PEMs at the point of care is of minimal cost, and its benefits improve patient outcomes (Howden et al., 2022). PEMs for patients diagnosed with H. pylori improved provider efficiency by decreasing the time required to engage
in patient teaching. Projected improvement in patient outcomes and treatment compliance will also decrease costs at the project site.

The budget associated with the project site was insignificant as professional standards required providers to participate in training and in-services at the project site. All in-services and staff training were completed on-site. No additional costs were incurred by the project site or by providers at the project site. The cost of adding patient education materials to the EHR for patients diagnosed with H. pylori was in line with the medical directors’ goal to update and improve the quality of care for patients. As a result of this fact, the project site factored these costs into its annual budget. The practice's accountant estimated that the cost of the project’s implementation was nominal. A budget analysis table is presented in Appendix F.

**Timeline**

The quality improvement project took place over 31 days and was divided into five phases. In the pre-planning phase, the proposed project was presented to the site’s medical director and staff to determine the appropriateness for implementation. The medical director deemed the project feasible and without risk to patients or participants, and an IRB deferral letter was drafted for the University of Alabama’s Institutional Review Board (UA’s IRB.) An outline of the proposed project was provided to the medical director during this phase. Following the submission and approval of the project proposal from UA’s IRB, the project commenced with providers completing the in-service sign-up sheet.

In phase one, a 14-day pre-implementation chart review of the EHR was completed to record the number of patients diagnosed with H. pylori and record the number who received PEMs. This chart review was completed for each provider at the project site. The data was
recorded on Google Sheets for each provider. The providers’ chart data was alphabetically coded without identifying information.

In phase two, a 15-minute provider in-service was given to instruct providers on accessing PEMs for patients diagnosed with H. pylori at the point of care. The in-service also explained the importance of providing PEMs to patients diagnosed with H. pylori. Following the approval of the PEMs by the medical director and senior stakeholders, PEMs for patients diagnosed with H. pylori were added to the EHR with a point-of-care reminder for participants. The IT director assisted with this process.

In phase three, a 14-day post-implementation chart review occurred to determine the number of patients diagnosed with H. Pylori and the number who received PEMs at the point of care. This information was recorded for each provider. The IT manager generated a report of any issues that occurred during the implementation of the project, and none were reported.

In phase four, data analysis was completed. The data was password protected on Google Sheets and uploaded to Intellectus Statistics. A paired \( t \)-test compared participants’ use of PEMs at the point-of-care pre-and post-intervention. Data from the chart reviews also compared the difference in the percentage of patients diagnosed with H. pylori who received PEMs at the point of care pre- and post-in-service by each participant. A one-way ANOVA and MANOVA were applied to assess if a difference existed between participant sex, training, and experience.

In phase five, a final report was generated with detailed findings of the project and given to providers. Stakeholders and the medical director were presented with the results of the project. A summary report was also e-mailed to the IT manager and practice manager for review. No de-identification process was required as all provider information was alphabetically coded. A table of the project timeline is presented in Appendix G.
Ethical Considerations/Protection of Human Subjects

The principal investigator received approval from UA’s IRB before implementing the research project. The project involved no human subjects. An IRB deferral letter from the project site was provided to the IRB via e-protocol. A waiver of informed consent was requested and approved as the project involved chart reviews of existing data. A copy of the IRB deferral letter and IRB approval notification is presented in Appendix H.

No patient or provider-identifying information was taken from the chart reviews of the EHR or the in-service sign-up sheet. Only the diagnosis, provider discharge plan, and provider demographic information were recorded. Each chart review was recorded on Google Sheets and providers coded alphabetically. Data was password protected on the principal investigator’s laptop. All electronic files were only accessible by the principal investigator and are HIPPA compliant and maintained in UA Box.

All project participants were protected by the Health Insurance Portability and Accountability Act of 1996 (HIPPA) which, among others guarantees, protects the privacy of patients’ health information (Modifications to HIPPA Privacy, Security, Enforcement, and Breach Notification Rules, 2013). The risk to participants of the project was no different from the risk encountered in daily clinical practice.
Results

The DNP project was a quality improvement project to increase the use of PEMs for patients diagnosed with H. pylori at Anne Arundel Gastroenterology’s outpatient centers. Following the approval of the University of Alabama’s IRB, the project commenced. Data was collected from the chart reviews of providers (n = 15) for analysis. The average years of experience of providers was 8.3 years and with 46% female (n = 7) 53% male (n = 8) 33% nurse practitioners (n = 5), 60% physicians (n = 9), and one physician assistant.

A 14-day pre-implementation chart review was completed to determine the number of PEMs given to patients diagnosed with H. pylori at the point of care. The review yielded that 5 patients of 89 patients with the diagnosis of H. pylori received PEMs from providers. Following the chart review, an in-service was given to 14 providers with instructions on access and the importance of PEMs for patients diagnosed with H. pylori. One provider was not available for the in-service. PEMs for patients diagnosed with H. pylori were approved by the clinical director and added to the EHR with a point-of-care reminder for provider use.

Following the in-service, a 14-day post-implementation chart review of provider encounters was conducted to record the number of PEMs given to patients diagnosed with H. pylori. 79.6% of providers adhered to the point-of-care reminder and provided PEMs to patients diagnosed with H. pylori. A total of 103 charts of providers were reviewed with 82 recording evidence of dissemination of PEMs for patients diagnosed with H. pylori post-intervention.

Statistical data analysis was conducted to determine the efficacy of the project intervention. Multivariant analysis was also conducted to determine relationships between characteristics: pre- and post-instruction. A report of the final project results was prepared and presented to staff and stakeholders at the project site. A copy of the raw data is presented in Appendix I.
A two-tailed paired samples $t$-test was conducted to examine whether the mean difference between the number of PEMs given to patients diagnosed with H. pylori pre-in-service and the number of PEMs post-in-service significantly differed from zero. The calculated p-value was significant. The standard deviation of the mean was calculated and compared.

A Shapiro-Wilk test was conducted to determine whether the differences in the number of PEMs pre-intervention and the number of PEMs post-intervention could have been produced by a normal distribution. The Shapiro-Wilk test results were insignificant based on an alpha value of .05, $W = 0.94, p = .379$. This result suggests the possibility that the differences in the number of PEMs pre-intervention and the number of PEMs post were produced by a normal distribution cannot be ruled out, indicating the normality assumption is met.

The result of the two-tailed paired samples $t$-test was significant based on an alpha value of .05, $t(14) = -11.00, p < .001$, indicating the null hypothesis can be rejected. This finding suggests the difference in the mean of the number of PEMs pre-intervention and the mean of the number of PEMs post was significantly different from zero. The mean of the number of PEMs pre-intervention was significantly lower than that of the number of PEMs post-intervention. The results are presented in Table 1. A bar plot of the means is presented in Figure 1.

**Table 1**

*Two-Tailed Paired Samples $t$-Test for the Difference Between Number of PEMs pre and Number of PEMs post*

<table>
<thead>
<tr>
<th>Number of PEMs pre</th>
<th>Number of PEMs post</th>
<th>$t$</th>
<th>$p$</th>
<th>$d$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
<td>$SD$</td>
<td></td>
</tr>
<tr>
<td>0.33</td>
<td>0.49</td>
<td>5.47</td>
<td>1.85</td>
<td>-11.00</td>
</tr>
</tbody>
</table>


*Figure 1.*

*The means of Number of PEMs pre and Number of PEMs post with 95.00% CI Error Bars*
An analysis of variance (ANOVA) was conducted to determine whether there were significant differences in the number of PEMs post by sex and training. The assumption of normality was assessed by plotting the quantiles of the model residuals against the quantiles of a Chi-square distribution. The assumption of normality was met. Figure 2 presents a Q-Q scatterplot of model residuals.
Figure 2

Q-Q scatterplot for normality of the residuals for the regression model.

The ANOVA was examined based on an alpha value of .05. The results of the ANOVA were not significant, $F(3, 11) = 1.37, p = .304$, indicating the differences in the number of PEMs post among the levels of sex and training were all similar (Table 2). The main effect, Sex was not significant, $F(1, 11) = 0.62, p = .446$, indicating there were no significant differences of the number of PEMs post by sex. The main effect, training was not significant, $F(2, 11) = 1.92, p = .193$, indicating there were no significant differences of the number of PEMs post by training levels. The means and standard deviations are presented in table 3.

Table 2

<table>
<thead>
<tr>
<th>Term</th>
<th>SS</th>
<th>df</th>
<th>$F$</th>
<th>$p$</th>
<th>$\eta_p^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>1.97</td>
<td>1</td>
<td>0.62</td>
<td>.446</td>
<td>0.05</td>
</tr>
<tr>
<td>Training</td>
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<td>2</td>
<td>1.92</td>
<td>.193</td>
<td>0.26</td>
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<tr>
<td>Residuals</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variance*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3

Mean, Standard Deviation, and Sample Size for Number of PEMs post by Sex and Training
A multivariate analysis of variance (MANOVA) was conducted to assess if there were significant differences in the linear combination of the number of PEMs post and years of experience between the levels of sex and training.

A correlation matrix was calculated to examine multicollinearity between the dependent variables. All variable combinations had correlations less than 0.9 in absolute value, indicating the results are unlikely to be significantly influenced by multicollinearity. The correlation matrix is presented in Table 4.

Table 4

Correlations between Dependent Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Number of PEMs post</td>
<td>-</td>
<td>.19</td>
</tr>
<tr>
<td>2. Experience</td>
<td>.19</td>
<td>-</td>
</tr>
</tbody>
</table>

The main effect for sex was not significant, $F(2, 10) = 0.42, p = .665, \eta^2_p = 0.08$, suggesting the linear combination of the number of PEMs post and years of experience was similar for each level of sex. The main effect for training was not significant, $F(4, 22) = 1.04, p = .407, \eta^2_p = 0.16$, suggesting the linear combination of the number of PEMs post and years of experience was similar for each level of training. The MANOVA results are presented in Table 5.
Table 5

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pillai</th>
<th>F</th>
<th>df</th>
<th>Residual df</th>
<th>p</th>
<th>ηp²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>0.08</td>
<td>0.42</td>
<td>2</td>
<td>10</td>
<td>.665</td>
<td>0.08</td>
</tr>
<tr>
<td>Training</td>
<td>0.32</td>
<td>1.04</td>
<td>4</td>
<td>22</td>
<td>.407</td>
<td>0.16</td>
</tr>
</tbody>
</table>

**Interpretation/Discussion**

The DNP project confirmed the benefits of a point of care reminder in clinical practice to improve the use of PEMs. It also supports research findings documenting this mechanism as beneficial for patient interactions and education (Coma et al., 2019). The project's goal of 80% provider use of PEMs for patients diagnosed with H. pylori at the point of care was met suggesting that staff education in clinical practice is impactful. This aligns with the current literature supporting this fact (Boltin, 2018).

The project had strengths as well as some limitations. The project's strengths were that it increased patient education materials available to patients. It also improved providers' use of patient education materials at the point of care in clinical practice. The project addressed a deficiency in PEMs for a common diagnosis. The project implementation was economical, and the project site incurred marginal costs. The project outcomes were beneficial to both patients and providers. These outcomes improved the quality of care.

The project's limitation was that the site involved multiple satellite offices with providers on different schedules. This required multiple in-services to be given to providers at various locations with one provider being unavailable for the in-service. The provider did however receive the project overview. A similar process was adopted to present staff with the final project report. This impacted the communication process with the providers during the project implementation but was mitigated by scheduling meetings with providers at their convenience.
Another project limitation was that the EHR search platform was not conducive to efficient chart reviews of an active diagnosis code. As a result of this issue, multiple chart reviews of the EHR were required to determine which diagnosis codes for H. pylori were historic vs. active. The charts with historic diagnosis codes were excluded from the review. As a result of this issue, a significant amount of time was spent reviewing charts in the EHR.

The short timeline of the project implementation was a mild hindrance but was addressed with an aggressive implementation strategy that utilized regular communication with providers and stakeholders. The short timeline likely influenced the overall results as an increase in the timeline post-in-service from 14 to 30 days may degrade the level of provider adherence to the point of care reminder for the use of PEMs. This ultimately affected the project results as less data was available for analysis.

A power analysis of the paired t-test indicated the minimum sample size to yield a statistical power of 0.8, and a large effect was 15. This aligned with the project’s provider sample size of 15. A power analysis of both the ANOVA and MANOVA indicated a medium effect, suggesting a larger sample size is required to have full confidence in the statistical analysis. Although this suggested a medium effect between characteristics with both the ANOVA and MANOVA, the results suggested that sex, training, and experience did not effect the number of PEMs provided post in-service.

The project implementation process was consistent with the theoretical framework of the Iowa Model that was adopted to guide the QI project. The theoretical framework encourages clinicians to seek opportunities in practice to improve healthcare. The Iowa Model’s initial steps require clinicians to question current practice standards (Melnyk, Mazurek & Fineout-Overholt, 2018). Despite its prevalence in clinical practice, the project site practice standards were
deficient in PEMs for patients diagnosed with H. pylori. This deficiency was addressed successfully with the implementation of the project.

The project provided evidence that change in current practice policy is warranted to routinely review and update the PEMs for clinical practice. Clinical directors should regularly complete a review of current available PEMs with provider input. This process is sustainable, economical, and operationally feasible for the project site.

**Conclusion**

Helicobacter pylori (H. Pylori) is the most prevalent bacterial disease in the world. It exists in over 50% of the population globally and can cost society over 5 billion dollars if untreated (Shah et al., 2022). It can cause chronic digestive disorders and lead to mucosa-associated lymphoid tissue lymphoma (MALT) lymphoma (Raderer & Kiesewetter). Treatment failure, by some estimates, is as high as 20% (Shah et al., 2022). Research has shown that patient education materials (PEMs) for patients diagnosed with H. pylori can significantly improve treatment outcomes (Betschart et al., 2019).

The project confirmed that introducing PEMs in clinical practice with teaching and a point of care reminder for staff can increase the use of PEMs at the point of care for patients diagnosed with H. pylori. The process is economical and can improve the quality of care for patients in an outpatient setting. Clinical directors should be mindful of this and ensure that current practice policies include regular reviews and updates to PEMs for staff access.
References


Appendix A

The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care
Appendix B

Patient Education Materials Assessment Tool (PEMAT)

Use the items below to figure out if a material can be designated as “easy-to-read.”

See page 5 for an annotated sample material that can be designated as “easy-to-read.”

A few tips before you get started

- If it’s your first time using the tool, read through the items before you begin assessing the material.
- You may find it helpful to read the whole material before you assess it.
- Mark each item as either “yes” or “no.”
- You must score items 1 through 6 for every material.
- Only score item 7 if the material has visual aids. Only score item 8 if the material has numbers.
- Materials must get a “yes” on all required items to be considered “easy-to-read.”

A note on cultural relevance

In addition to using this tool to determine if materials are “easy-to-read,” it’s important to make sure materials are culturally relevant for readers. Any time you’re assessing a material, keep cultural considerations in mind. For example:

- Does the material use language and examples (of activities, foods, etc.) that would be familiar to the audience?
- Are images representative of the audience’s race, ethnicity, age, gender, and ability?
- Does the material avoid perpetuating stereotypes?

1. **The material makes its purpose completely evident.**

   The material has an obvious main message near the top. Think of the main message as the most important thing for the audience to remember after reading the material. You need to be able to tell at a glance what the main message is.
2. **The material does not include information or content that distracts from its purpose.**

The material includes need-to-know information only — it skips the nice-to-know details. The idea is to focus on key information readers need in order to take action. Ask yourself whether any of the information would distract or overwhelm you if you were unfamiliar with the material’s topic.

Longer materials are more likely to have distracting information, but there’s no set maximum length for materials to get a “yes” on this item. Keep in mind that the material *does* need to include all the content that’s relevant to understanding the main message.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

3. **The material uses common, everyday language. Medical terms are used only to familiarize the audience with the terms. When used, medical terms are defined.**

The material uses plain language that everyone can understand (e.g., “high blood pressure,” not “hypertension”). When unfamiliar terms are necessary, the material explains them in context and provides an in-text definition using easy-to-understand language. (Think: a reader just diagnosed with diabetes probably needs to learn the term “glucose.”) Ask yourself whether you’d understand all of the terms in the material if you didn’t know anything about the topic.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

4. **The material uses the active voice.**

The material mostly uses active voice and avoids passive voice. Ask yourself: Is the subject of the sentence *doing* the action (e.g., “experts recommend that you get a flu shot”)? If so, it’s active voice. Or is the subject *receiving* the action (e.g., “getting a flu shot is recommended by experts”)? That’s passive voice.
5. The material breaks or “chunks” information into short sections.

The content in the material is divided into short chunks of information with headings. Think about whether you can quickly scan the material and find the information you’re looking for. Does the amount of content in each section feel manageable, or is it overwhelming?

Yes  No

6. The material uses visual cues (e.g., arrows, boxes, bullets, bold, larger font, highlighting) to draw attention to key points.

The material signals where to find important information and emphasizes it with visual elements. Scan the material and ask yourself: Is it clear where you’ll find key takeaways before you even read the words? Also check that the material uses these visual cues selectively — they can become less effective if they’re overused.

Yes  No
7. **The material’s visual aids support the main message or represent the intended audience. (score only if material includes visual aids)**

Visual aids like photos, illustrations, and graphics can make health education materials easier to understand, more engaging, and more relatable. Think about whether the material’s visual aids could help the intended audience understand the content better — or help them relate to the material. For example, in a material with a main message about taking steps to prevent lead poisoning in children, a photo of peeling paint in an older home could help readers understand what to look for. (Keep in mind that it’s best for all health education materials to have visual aids.)

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
</table>

8. **Numbers appearing in the material are clear and easy to understand. (score only if material includes numbers)**

Check that the material uses simple numbers — like whole numbers rather than fractions and decimals. Keep in mind that frequencies (e.g., 3 out of 10) are generally easier to understand than percentages (e.g., 30%). And make sure the material uses numerals (e.g., 3, 2nd) rather than spelled-out numbers (e.g., three, second).*

**Context** for numbers — in the form of words or additional numbers, like a range — can also indicate clear use of numbers. So can **visual metaphors** (e.g., “1 ounce of cheese is about the same size as 3 dice”).

Finally, check that the material always does the math for the readers. Make sure it doesn’t ask them to add, subtract, multiply, divide — or do any other kind of calculation.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
</table>

**Material gets a “yes” on □ out of □ relevant items**

*Keep in mind that some style guides (e.g., APA style) recommend spelling out numbers under 10. Use your judgment on how to assess materials that include spelled-out numbers for this reason but would otherwise get a “yes” on all items in the assessment tool.
Annotated example

This material gets a “yes” on all items in the assessment tool. The callouts explain why the material gets a “yes” on the items.

**Get Rid of Unused Opioids Safely**

Help keep your family and pets safe by getting rid of unused or expired (out of date) opioid medicines as soon as possible. Opioid medicines are prescription drugs used to treat pain.

**Why is it so important to get rid of unused opioids safely?**

Opioids are powerful medicines, and they can be very dangerous when people use them incorrectly. If a person misuses or accidentally takes an opioid meant for someone else, a single pill could cause death. In fact, opioids were involved in about 47,000 overdose deaths in 2018 — that’s nearly 7 out of every 10 drug overdose deaths.

So it’s very important to take them exactly as prescribed and get rid of them right away when you no longer need them.

**How can I get rid of my unused opioids safely?**

There are a few ways you can get rid of opioid medicines that you no longer need:

- The best way to get rid of medicines is to use a medicine take-back program. At medicine take-back sites, professionals will take your medicine and get rid of it safely. You can find a take-back site near you by calling 1-800-882-9539 or visiting http://disposeynmeds.org.
- Depending on what type of opioid you need to get rid of, you may be able to flush it down the toilet. Ask your doctor or pharmacist about what’s safe to flush.

**Where can I learn more about getting rid of medicines safely?**

If you want to learn more about how to safely get rid of medicines in your community, call your doctor, pharmacist, or local police station.

Remember, it’s important to get rid of unused opioids safely as soon as you no longer need them.
About the Health Education Materials Assessment Tool

NLM’s assessment tool is based on the understandability items from the Patient Education Materials Assessment Tool for Printable Materials (PEMAT-P), developed by the Agency for Healthcare Research and Quality (AHRQ).

In 2019, NLM engaged health literacy subject matter experts (SMEs) to discuss the development of the PEMAT-P and other understandability assessment tools. The ultimate goal was to create an abridged tool that NLM can use to designate health education materials as “easy-to-read.” The SMEs helped NLM identify a subset of PEMAT-P understandability items that may be the most useful for measuring understandability. To assess and refine the subset items, NLM conducted a series of qualitative studies with consumers who have limited health literacy skills.

In 2020, NLM completed additional research aimed specifically at increasing understanding of numeracy best practices in health education materials. Based on the results of this research and existing best practices, NLM expanded the numeracy guidance in its assessment tool, adding more detailed tips and additional examples.

Then, in 2021, NLM completed research to learn about best practices related to using visual aids in health education materials. Based on the research results and existing best practices, NLM revised the visual aids item and guidance in its assessment tool. NLM also added considerations for assessing materials for cultural relevance.

This multiphase research yielded the items above and together, they form a tool for reviewers to quickly assess the understandability of health education materials.

Learn more about the PEMAT-P and how it measures understandability in consumer-facing health education materials:

- PEMAT and User’s Guide
- PEMAT for Printable Materials (PEMAT-P)
Appendix C

H. pylori: What You Need to Know

Anne Arundel Gastroenterology Associates, P.A.

What is H. pylori?

H. pylori (Helicobacter pylori) are bacteria that can cause an infection in the stomach or duodenum (first part of the small intestine). It’s the most common cause of peptic ulcer disease. H. pylori can also inflame and irritate the stomach lining (gastritis). Untreated, long-term H. pylori infection can lead to stomach cancer (rarely).

Who gets H. pylori infections?

H. pylori bacteria are present in some 50% to 75% of the world’s population. It does not cause illness in most people. H. pylori infection mostly occurs in children. It’s more common in developing countries. In the U.S., H. pylori bacteria are found in about 5% of children under the age of 10. Infection is most likely to occur in children who live in crowded conditions and areas with poor sanitation.

Can H. pylori spread from person to person?

Yes, H. pylori can spread from person to person. H. pylori are found in saliva, plaque on teeth and poop. Infection can be spread through kissing and by transferring the bacteria from the hands of those who have not thoroughly washed them after a bowel movement. It can be spread through contaminated water and food.

What’s the association between H. pylori infection and stomach cancer?

If you have an _H. pylori_ infection, you have an increased risk for stomach cancer later in life. If you have a strong family history of stomach cancer and other cancer risk factors, even though you may not have symptoms of a stomach ulcer, your healthcare provider may recommend being tested for _H. pylori_ antibodies. In addition to screening and treatment, your provider may suggest some lifestyle changes, such as including more fruits, vegetables and fiber in your diet. Regular checkups with your provider and following their recommendations can reduce your cancer risk.

What are the symptoms of H. pylori infection?

Symptoms and signs, if present, are those that arise from gastritis or peptic ulcer and include:

- Dull or burning pain in your stomach (more often a few hours after eating and at night). Your pain may last minutes to hours.
- Unplanned weight loss.
- **Bloating**, **Burping**
- **Nausea and vomiting** (bloody vomit).
- **Indigestion (dyspepsia)**. Loss of appetite
- Dark stools (from blood in your stool).

How is H. pylori treated?

_H. pylori_-caused ulcers are treated with a combination of antibiotics and an acid-reducing proton pump inhibitor. A breath test or stool test will be completed 14 days after you finish your treatment to confirm the absence of the bacteria.

Source: Cleveland Clinic-Cleveland, Ohio. For additional information go to: clevelandclinic.org/health/disease/h-pylori

“Setting the standard for Gastroenterology”
Appendix D

Provider sign-up/in-service sheet for the DNP project: Measuring Provider Adherence to a Point-of-Care Reminder for H. pylori Patient Education: A Quality Improvement Project

<table>
<thead>
<tr>
<th>Name</th>
<th>NP/PA</th>
<th>MD</th>
<th>Years Experience</th>
<th>Sex M/F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>
Appendix E

Flowchart of Chart Review Process
Retrospective and Prospective

Charts Sampled in the EHR n = 242

Eligible for review n = 192

Positive for screening criteria n = 192

Excluded n = 50

Total number of charts included in review n =
Pre-intervention = 89
Post-intervention = 103
Appendix F

DNP Project Cost Analysis

<table>
<thead>
<tr>
<th>Nurse Practitioner</th>
<th>Chart reviews = 8 hours</th>
<th>Total = $540</th>
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<tbody>
<tr>
<td>$60/Hour</td>
<td>Inservice =15 minutes</td>
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</tr>
<tr>
<td></td>
<td>IT Consultation = 30 minutes</td>
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</tr>
<tr>
<td></td>
<td>Project report = 15 minute</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Medical Director consultation</th>
<th>Consultation 2 hours</th>
<th>Total = $300</th>
</tr>
</thead>
<tbody>
<tr>
<td>$150/Hour</td>
<td>Consultation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 hours</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Practice Manager Consultation</th>
<th>Consultation 2 hours</th>
<th>Total = $80</th>
</tr>
</thead>
<tbody>
<tr>
<td>$40/Hour</td>
<td>Consultation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 hours</td>
<td></td>
</tr>
</tbody>
</table>

Total Project Cost = $920

Note: The cost for patient quality improvement at the project site was factored into the project site’s yearly budget. The total project cost was estimated based on time and salary. Additional hours were spent by the principal investigator off-site performing additional tasks supporting the project. These included but were not limited to data analysis, organizing project results, meeting with a statistician, revising the final manuscript. The hours are considered personal time in support of the graduate program and were not classified as employment hours. As a result of this fact, no related additional cost was incurred at the project site.
Appendix G

**Project Timeline=31 days, 2023**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Duration</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>3 days</td>
<td>Provider’s sex, professional degree, and years of experience were recorded on the in-service sign-up sheet without identifying information. A 14-day pre-implementation chart review of providers was completed.</td>
</tr>
<tr>
<td>II</td>
<td>5 days</td>
<td>An in-service was given to providers to instruct them on the use and importance of utilizing a point of care reminder to dispense PEMs to patients diagnosed with H. pylori. PEMs were added to the EHR following the in-services. Five separate groups participated in the in-service over a five-day period.</td>
</tr>
<tr>
<td>III</td>
<td>14 days</td>
<td>A 14-day post-implementation chart review was completed to determine the number of PEMs accessed at the point of care by each provider for patients diagnosed with H. pylori.</td>
</tr>
<tr>
<td>IV</td>
<td>6 days</td>
<td>Data analysis was completed in phase four. A paired <em>t</em>-test was conducted, as well as a one-way ANOVA and a MANOVA. Descriptive statistical analysis was also conducted.</td>
</tr>
<tr>
<td>V</td>
<td>3 days</td>
<td>Project results was prepared and presented to providers and stakeholders at the project site.</td>
</tr>
</tbody>
</table>
Appendix H

Request for Waiver of Informed Consent
Research Project: Provider Adherence to a Point-of-Care Reminder for H. pylori Patient Education: A Quality Improvement Project

To: The University of Alabama IRB

Background: Informed consent is one of the fundamental principles of ethical conduct in using human subjects and is mandated by Federal policy (45 CFR 46 Section 116). I request that a waiver of consent for the project titled above be permitted by the IRB. The essential conditions of my waiver request are:

I. The research involves no more than minimal risk to subjects;
   (2) The waiver or alteration will not adversely affect the rights and welfare of the subjects;
   (3) The research could not practicably be carried out without the waiver or alteration; and
   (4) Whenever appropriate, the subjects will be provided with additional pertinent information after participation.

II.

III. The study will be completed by conducting a chart review of existing patient records to determine the number of patients diagnosed with H. pylori who received patient education materials. The study will be reviewing pre-existing patient chart information. No new diagnoses or treatments will occur.

IV.

V. The information taken from patient charts will not include any identifiable information so this study will not violate the subject’s rights. The study involves a chart review of all subjects diagnosed with Helicobacter pylori who had encounters with providers at the project site. The information will be coded numerically.

VI.

VII.

VIII. Best Regards,

IX. Carl Wheeler, DNP Student, Principal Investigator

X. Contact: Ph 410-925-7685

XI. E-mail: cawheeler4@crimson.ua.edu

XII.
May 31, 2023

To: Carl Wheeler, MSN
   DNP Student
   Capstone College of Nursing
   Box 870358

From: carpantato T. Myles, MSM, CIM, CIP
   Director & Research Compliance Officer

Re: Notice of Approval

IRB Application #: e-Protocol 23-04-6567
Project Title: "Measuring Provider Adherence to a Point-of-Care Reminder for H. pylori Patient Education: A Quality Improvement Project"
Submission Type: New
Approval Date: May 31, 2023
Expiration Date: May 30, 2024
Funding Source: None
Review Category: EXEMPT
Approved Documents: Waiver of Informed Consent

Dear Mr. Wheeler:

The University of Alabama Institutional Review Board has approved your proposed research. Therefore, your application has been approved according to 45 CFR part 46 as outlined below:

(4) Secondary research for which consent is not required: Secondary research uses of identifiable private information or identifiable biospecimens, if at least one of the following criteria is met: (ii) Information, which may include information about biospecimens, is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be
ascertained directly or through identifiers linked to the subjects, the investigator does not contact
the subjects, and the investigator will not re-identify subjects;

The approval for your application will lapse, as noted above. If your research will continue
beyond this date, please submit the Continuing Review to the IRB as University policy requires
before the lapse. Please note any modifications made in research design, methodology, or
procedures must be submitted to and approved by the IRB before implementation. Please submit
a final report form when the study is complete.

All the best with your research.

166 Rose Administration I Box 870127 | Tuscaloosa, AL 35401 | 205-348-8461 | rscompliance@ua.edu
## Appendix I

<table>
<thead>
<tr>
<th>Provider</th>
<th>Sex</th>
<th>Training</th>
<th>Experience</th>
<th>In_service_attended_pre</th>
<th>In_service_attended</th>
<th>Number_of_PEMS_post</th>
<th>Number_of_PEMS_pre_Scale_1</th>
<th>Number_pt_post</th>
<th>Number_pt_pre</th>
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</thead>
<tbody>
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<tr>
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<td>6</td>
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</tbody>
</table>
Raw Output

Paired t-Test for Number_of_PEMS_pre_Scale_1 and Number_of_PEMS_post

Included Variables:
Number_of_PEMS_pre_Scale_1 and Number_of_PEMS_post

Sample Size (Complete Cases):
N = 15

Shapiro-Wilk Test:
W = 0.940, p = 0.379

Results:

<table>
<thead>
<tr>
<th>Number_of_PEMS_pre_Scale_1</th>
<th>Number_of_PEMS_post</th>
<th>t</th>
<th>p</th>
<th>d</th>
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<tbody>
<tr>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>-11.000</td>
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<tr>
<td>0.333</td>
<td>0.488</td>
<td>5.467</td>
<td>1.846</td>
<td></td>
</tr>
</tbody>
</table>

Note. n = 15, df = 14.

Confidence Interval Based on α = 0.0500:
Lower Limit = -6.134, Mean Difference = -5.133, Upper Limit = -4.132

Analysis of Variance for Number_of_PEMS_post by Sex and Training

Included Variables:
Number_of_PEMS_post, Sex, and Training

Sample Size (Complete Cases):
N = 15

ANOVA Results:

<table>
<thead>
<tr>
<th>Term</th>
<th>SS</th>
<th>df</th>
<th>F</th>
<th>p</th>
<th>η^2</th>
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<tr>
<td>Sex</td>
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<td>0.624</td>
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<td>Training</td>
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<td>2</td>
<td>1.920</td>
<td>0.193</td>
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<tr>
<td>Residuals</td>
<td>34.783</td>
<td>11</td>
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</tbody>
</table>

Means Table:

<table>
<thead>
<tr>
<th>Combination</th>
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<th>n</th>
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<tr>
<td>F : PA</td>
<td>7.000</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>M : PA</td>
<td>NaN</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>F : NP</td>
<td>6.000</td>
<td>2.160</td>
<td>4</td>
</tr>
</tbody>
</table>
MANOVA with Sex and Training by Number_of_PEMs_post and Experience

Included Variables:
Number_of_PEMs_post, Experience, Sex, and Training

Sample Size (Complete Cases):
N = 15

Homogeneity of Covariance Matrices: Box's M Test
Box's M test could not be conducted.

Correlation Matrix for Number_of_PEMs_post and Experience

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Number_of_PEMs_post</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>2. Experience</td>
<td>0.188</td>
<td>-</td>
</tr>
</tbody>
</table>

MANOVA Model Results:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pillai</th>
<th>F</th>
<th>df</th>
<th>Residual df</th>
<th>p</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
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<td>10</td>
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<tr>
<td>Training</td>
<td>0.319</td>
<td>1.044</td>
<td>4</td>
<td>22</td>
<td>0.407</td>
<td>0.160</td>
</tr>
</tbody>
</table>