

Original Publication

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# A Quality Improvement Educational Intervention to Increase Knowledge of Cardiogastroenterology Amongst Medical Trainees and Nursing Staff

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## Abstract

**Introduction:** The American Society of Gastrointestinal Endoscopy recommends continuing aspirin prior to routine endoscopy. National data show that few endoscopists follow the current guidelines due to concern about bleeding and perceived minimal downside to stopping aspirin. Utilizing the Kern model, we implemented an educational quality improvement initiative aimed at increasing knowledge of antithrombotic management periendoscopy and during acute gastrointestinal (GI) bleeding. **Methods:** We implemented an interactive lecture incorporating a large-group discussion to help residents learn to define low- versus high-risk procedures, distinguish thrombotic risk in medical conditions, present the procedural risks associated with use of antiplatelets, and list current practice guidelines. Nursing staff received a tailored lecture with the goal of learning proper management of current antiplatelets and holding parameters for anticoagulants prior to endoscopy. Both groups received pre-and posttest questionnaires evaluating their knowledge. **Results:** Eighteen nurses and 75 medical trainees received this intervention. Significant score improvement was noted in both groups. The greatest change was seen in aspirin management (30.5% vs. 95.0% for group 1, 43.7% vs. 91.9% for group 2;  $p < .0001$ ). For management of antiplatelets after aspirin-induced GI bleed, the medical trainees improved from 50.7% to 93.3%. Chi-square analysis showed a statistically significant difference in knowledge across all areas among medical trainees pre-and posttest ( $p < .001$ ). **Discussion:** This quality-based educational intervention significantly increased the knowledge of nurses and medical trainees in management guidelines that directly impact patient care. Similar educational programs may be very effective in improving quality and safety.

## Appendices

- A. Nursing Pretest.docx
- B. Nursing Posttest.docx
- C. Resident Pretest.docx
- D. Resident Posttest.docx
- E. Antithrombotics and Endoscopy Resident Presentation.pptx
- F. Nursing Handout.docx
- G. Resident Handout.docx

*All appendices are peer reviewed as integral parts of the Original Publication.*

## Keywords

Education, Aspirin, Hemorrhage, Quality Improvement, Gastroenterology, Guidelines, Bleeding, Endoscopy, Antithrombotic, Fibrinolytic Agents, Clopidogrel

## Educational Objectives

By the end of this session, resident learners will be able to:

1. Define low- versus high-risk endoscopic procedures.
2. Distinguish between medical conditions with low and high thrombosis risk (that require use of antithrombotics).
3. Present the procedural risks associated with use of antiplatelets and anticoagulants.
4. List the main conclusions from the 2016 American Society of Gastrointestinal Endoscopy (ASGE) guidelines.

By the end of this session, nurse learners will be able to:

1. Explain ASGE guidelines for proper management of common antiplatelets for routine procedures.
2. Describe holding parameters for anticoagulants prior to endoscopic procedures.

## Introduction

In routine endoscopic procedures, high bleeding risk is incurred during endoscopic mass excision, luminal dilation, and hemorrhagic vessel clipping.<sup>1</sup> Postpolypectomy bleeding occurs in 3.0%-6.1% of all colonoscopic polypectomies.<sup>2,3</sup> In most cases, endoscopic therapy is sufficient<sup>4</sup>; however, a subset of these patients will require radioembolization or surgery.<sup>2</sup> This risk is affected by coagulation status, excision technique, and

polyp type<sup>5</sup>; it can occur immediately or be delayed up to 30 days.<sup>6</sup> Bleeding risk must be weighed against the likelihood of thrombosis when making a preprocedural anticoagulation plan.

Complications associated with holding anticoagulation also vary. The highest risk occurs in patients with recent coronary stents, thromboembolic history with mechanical mitral valve, or atrial fibrillation, as well as those with valvular abnormalities, prosthetic valve, heart failure with reduced ejection fraction, hypertension, diabetes, and older age.<sup>1</sup> A meta-analysis of mechanical valves' thrombosis risk found an overall rate of valve thrombosis of 1.7% per year without anticoagulation, with a 4% risk of major embolism.<sup>7</sup> Mitral valves confer a 1.5-fold increase in thromboembolism and a fivefold increase in valvular thrombosis compared to mechanical aortic valves. Even in the absence of valvular disease, many studies have demonstrated significant risk associated with holding aspirin, even for relatively short periods of time.<sup>8,9</sup>

In 1996, there were minimal data on the bleeding risk related to continuing antiplatelet agents preprocedurally. A large survey of over 1,260 American Society for Gastrointestinal Endoscopy (ASGE) members, including gastroenterology fellowship program directors, showed that 81% stopped aspirin and nonsteroidal anti-inflammatory drugs (NSAIDs) prior to colonoscopy, 79% prior to endoscopic retrograde cholangiopancreatography, and 51% prior to upper endoscopy.<sup>10</sup> Of those who continued the medications, 50%-80% would not perform biopsies.<sup>10</sup> Warfarin was also stopped based on perceived risk. Historically, it was thought that the bleeding risk associated with continued aspirin and NSAID use during routine endoscopic procedures outweighed the benefit of uninterrupted anticoagulation. However, data from subsequent studies did not support this theory. A large meta-analysis of 1,490 articles showed that there was no change in postpolypectomy bleeding for patients on NSAIDs or aspirin (odds ratio [OR] = 1.1; 95% confidence interval [CI], 0.7-1.9;  $p = .7$ ). The risk was elevated if the patient was continued on clopidogrel (OR = 9.7; 95% CI, 3.1-30.8;  $p = 0$ ) or clopidogrel with aspirin/NSAIDs (OR = 3.4; 95% CI, 1.3-8.8;  $p = .01$ ).<sup>11</sup> A study of 1,174 veterans also failed to show a link between continued NSAID or aspirin use and postpolypectomy bleeding.<sup>12</sup> Based on multiple studies showing similar results, the ASGE guidelines in 2009 recommended continuing aspirin and NSAIDs prior to routine gastrointestinal (GI) procedures.<sup>1</sup> The British Society of Gastroenterology and European Society of Gastrointestinal Endoscopy guidelines followed suit.<sup>13</sup>

Recent survey data show that most of the American GI community still has not adopted the current guidelines into clinical practice. A survey of 239 endoscopists at two separate GI conferences showed that only 30% followed the ASGE guidelines.<sup>14</sup> A second study of 317 endoscopy units, published in the *American Journal of Gastroenterology*, showed that less than half of the units continued aspirin before screening colonoscopies due to concern about bleeding and perceived minimal downside to stopping aspirin.<sup>15</sup> Other studies found that clinicians were reluctant to continue NSAIDs because of unfamiliarity with ASGE guidelines, perceived nonapplicability to their patient population, and assumed limited validity in spite of prevailing data, as well as inertia, heuristics, and anecdotal experience.<sup>16,17</sup> Even in our own institution, many still recommend holding aspirin.

We sought to provide an educational intervention to (1) survey the knowledge of the internal medicine house staff and nurses regarding continuation of antithrombotic agents prior to GI procedure and management of acute GI bleeding (residents only) and (2) evaluate an educational module on current guidelines. Our plan was to design an intervention that would fulfill the goals set forth by the outcome-based ACGME competencies, specifically, medical knowledge (MK), systems-based practice (SBP), and patient care (PC).<sup>18</sup>

## Methods

### Participants

Eighteen nurses (group 1) and 75 medical trainees (group 2) were evaluated. The medical trainees included 40 medical students on their internal medicine clerkship or acting internship and 35 internal medicine residents.

## Materials

- Nursing pretest (Appendix A): This deidentified questionnaire contains five questions tailored to the precolonoscopy teaching nursing staff. It was distributed to the primary care and gastroenterology subspecialty nurses prior to the educational intervention (brief talk). The answer key was not present on the version given to the nurses.
- Nursing posttest (Appendix B): The same questionnaire as Appendix A, this was distributed to nurses after the talk. The version given to the nurses did not contain the answer key.
- Resident pretest (Appendix C): This deidentified questionnaire contains eight questions focusing on antithrombotic management related to routine colonoscopies and acute GI hemorrhage. It was given to the residents prior to the educational intervention. The answer key was not present on the version given to the residents.
- Resident posttest (Appendix D): This is the same questionnaire as Appendix A, with the addition of a 10-point scale. It was distributed to residents after the talk. The answer key was not present on the version given to the residents.
- Antithrombotics and endoscopy resident presentation (Appendix E): This interactive lecture was taught during the noon conference series within our residency program.
- Nursing handout (Appendix F): This short handout summarizes the ASGE guidelines.
- Resident handout (Appendix G): This short handout summarizing the ASGE guidelines is similar to the nursing handout, with additional details applicable to medical residents.

## Design

*Overview:* The Kern model was used as a backbone for designing the educational intervention, as demonstrated by the list below.

1. General needs assessment: National data as well as anecdotal data from our center showed that the ASGE guidelines for antithrombotic management were not being followed. Our nurses were routinely telling patients to discontinue aspirin before routine endoscopy.
2. Targeted needs assessment: Residents were not routinely educated on updated guidelines. However, the ASGE recommendations directly impact the care of the patients seen in resident clinic as they are often referred to endoscopy.
3. Goals and objectives: By the end of the teaching sessions, nurses and residents should be able improve patient care by listing the main conclusions from 2016 ASGE guidelines. The residents should also be able to distinguish between medical conditions with low and high thrombosis risk (that require use of antithrombotics), define low- versus high-risk endoscopic procedures, and present the procedural risks associated with use of antiplatelets and anticoagulants.
4. Educational strategies: The intervention included a prepresentation survey to prime the learner to the topic being discussed, an interactive audiovisual presentation with use of animated PowerPoint and real-time audience participation, and postintervention testing for recall and solidification of the material. Of note, the nursing staff received a brief talk rather than the full PowerPoint.
5. Implementation: The settings were different for residents and nurses. Nurses' teaching occurred during their morning conferences (the best way to guarantee 100% participation). The residents were taught during noon conferences at all three sites to maximize the number of learners. All the resident sites were equipped with projectors.
6. Evaluation and feedback: The final survey assessed the ability of learners to retain the information; it also included a 10-point scale for residents and nurses to use to assess the utility and quality of the intervention.

*Survey design (Appendices A-D):* Using PubMed, a search was performed with the keywords *endoscopy*, *bleeding*, and *guidelines*. Along with the preceding guidelines in 2009, the recent 2016 ASGE guidelines were reviewed. Literature referenced in these documents was also reviewed, and our surveys were constructed based on that data.

*PowerPoint design (Appendix E):* The PowerPoint explains the importance of proper antithrombotic management, gives a brief history of the different agents, and discusses the guidelines while focusing on several pivotal studies. Presentation information was drawn from papers selected from the ASGE guidelines' bibliography to ensure that the studies had been used by the drafting committee.

*Handout design (Appendices F & G):* A chart was constructed based on the 2016 ASGE guidelines. The most important conclusions were also listed in bullet format.

*Educational intervention for residents:* To get maximum resident representation, the residents' talks were given by Dr. Elena Fradkov during noon conference at all three hospitals. Prior to each lecture, participants were oriented to intervention. To assess learner needs, the residents were first allotted 15 minutes to fill out eight-question surveys. They were then given a 30-minute PowerPoint presentation with discussion of the current literature regarding pre-endoscopy and post-GI-bleed anticoagulation management. The resident presentation was longer than the nursing intervention because it went into depth analyzing the studies the ASGE used to draft the guidelines. The resident presentation also described methods of managing anticoagulation in an inpatient setting with acute bleeding. The presentation included many slides with animated questions as well as a final interactive quiz of the main learning points. During the course of the talk, participants were allowed to ask questions. At the conclusion of the intervention, a second posttest survey was handed out to the residents to be completed in 10 minutes. This survey differed from the initial one by a single question—a 10-point scale to evaluate the efficacy of the teaching method. After all the surveys had been collected, the last 5 minutes were used to go over the questions. Participants were given handouts with a summary of the ASGE guidelines.

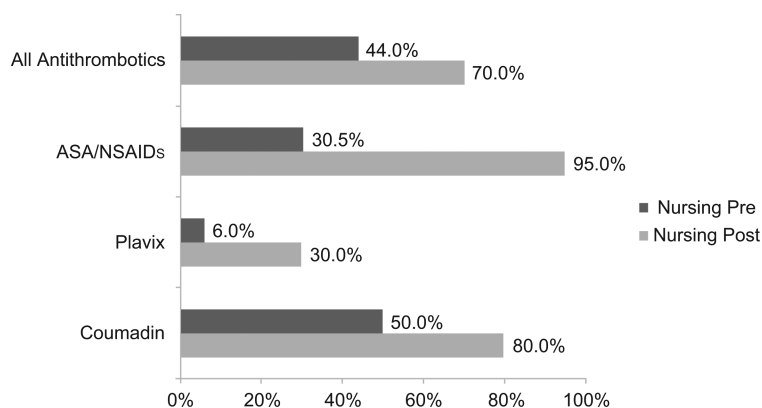
*Educational intervention for nurses:* To gather all the nurses involved in pre-endoscopy patient education, the nursing talks were given by Drs. Elena Fradkov and Renee Williams at the internal medicine and GI nurses' monthly meetings. The nurses were also oriented to the intervention, after which they received a five-question survey tailored to topics relevant to their involvement in preprocedure patient care. This part took about 10 minutes. Once the surveys had been collected, the nurses were given a 10-minute summary of the ASGE guidelines. They were allowed to ask questions during and after the talk. Following this discussion, the nurses spent another 10 minutes filling out the posttest. After the postsurvey, the answers were reviewed with nurses for 5 minutes, and the facilitator asked for feedback. The nurses were given handouts with an abridged summary of the ASGE guidelines.

#### Data Analysis

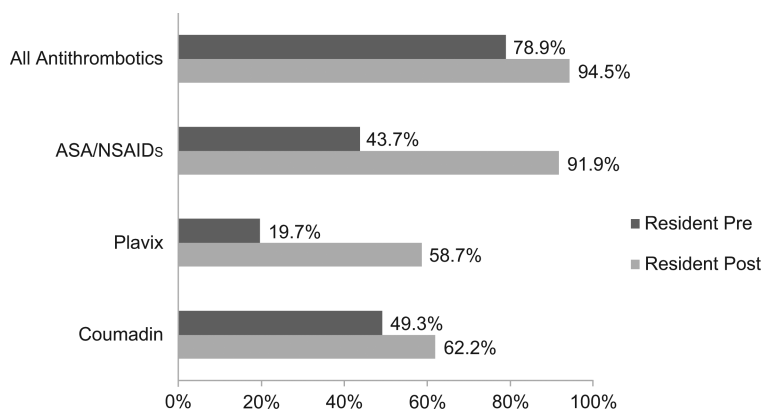
Pre- and posttest data were analyzed using chi-squares. It should be noted that chi-square analyses were obtained for the medical trainees group but not for the nursing group, due to lack of power. The posttest also included a question on the efficacy of the intervention.

#### Results

Group 1 consisted of 18 nurses, and group 2 consisted of 75 medical trainees. Improvement was seen in both groups between the preintervention and postintervention tests on questions regarding knowledge of guidelines for stopping antithrombotics prior to endoscopy (Figure 1 & Figure 2). Chi-square analysis showed a statistically significant difference in knowledge across all areas of antithrombotic management among medical trainees pre- and posttest ( $p < .001$ ). The greatest change was seen in knowledge of aspirin/NSAID management (30.5% vs. 95.0% for group 1, 43.7% vs. 91.9% for group 2;  $p < .0001$ ). Significant improvements were also seen in knowledge of clopidogrel management (6.0% vs. 30.0% for group 1, 19.7% vs. 58.7% for group 2;  $p < .0001$ ), as well as general knowledge of whether use of all antiplatelet agents needs to be suspended prior to endoscopy (44.0% vs. 70.0% for group 1, 78.9% vs. 94.5% for group 2;  $p = .005$ ). Knowledge of warfarin management pre-endoscopy improved for both groups but did not meet statistical significance in group 2 (50.0% vs. 80.0% for group 1, 49.3% vs. 62.2% for group 2;  $p = .12$ ).



**Figure 1.** Comparison of pre- and postintervention testing results regarding antithrombotic management periendoscopy in a group of primary care and specialty nurses. Data shown are the percentages of test takers who answered a given question correctly. ASA, acetylsalicylic acid; NSAIDs, nonsteroidal anti-inflammatory drugs.



**Figure 2.** Comparison of pre- and postintervention testing results regarding antithrombotic management periendoscopy in a group of medical trainees ( $p < .001$ ). Data shown are the percentages of test takers who answered a given question correctly. ASA, acetylsalicylic acid; NSAIDs, nonsteroidal anti-inflammatory drugs.

In addition, medical trainees were asked questions regarding risk factors for thrombosis, management of antiplatelet agents after aspirin-induced GI bleed, and post-GI-bleed warfarin therapy. At pretest, 50.7% of medical trainees knew when and how to restart antiplatelet medications after aspirin-induced GI bleed. Postintervention, this number increased to 93.3%. Knowledge of post-GI-bleed warfarin reinitiation improved from 15.2% preintervention to 82.7% postintervention. There was no significant change in knowledge of risk factors for thrombosis as a result of the intervention (10.7% vs. 9.1%).

Medical trainees were asked about the usefulness of the discussion regarding periendoscopy antithrombotic management using a 10-point scale (1 = *not useful at all*, 10 = *extremely useful*). The average response to this question was 7.5 out of 10, with 81.3% of respondents giving a rating greater than 5.0.

## Discussion

Our data show that there is a knowledge gap in the internal medicine community regarding proper management of antithrombotics preprocedurally. This finding mirrors data from multiple national studies of gastroenterologists.<sup>2,3</sup> An education survey published in 2015 compared physicians across multiple practices and found similarly alarming results, with providers routinely discontinuing aspirin and NSAIDs in direct contrast to current guidelines.<sup>19</sup> That survey found gastroenterologists were more likely than internal medicine providers to continue following older guidelines. The survey also noted that there was a linear inverse relationship between the percentage of correct answers and the number of years after graduation. Our resource targets internal medicine practitioners still in residency as well as nurses who perform the

preprocedure teaching. Residency is a crucial period in training, and intervening at this early level is important for developing good habits in the future. Furthermore, modifying physicians' practice habits requires both knowledge of current guidelines and an environment that not only is conducive to change but also encourages it,<sup>17</sup> making the academic medical center an ideal milieu for improvement.

By using the Kern model to design our resource, we sought to create a targeted intervention that would help close this knowledge gap while fulfilling the educational milestones. For clinical knowledge (MK1) and knowledge of diagnostic testing and procedures (MK2), we focused on describing the current ASGE guidelines and talked about colonoscopy risks and methods of hemostasis. Competency milestones SBP3 and SBP4 cover reducing risk of costly complications and proper transfer of patient care, respectively. We discussed how to use the current data to minimize the risks of both bleeding and clotting and how to properly transfer patients from primary care to gastroenterology specialists. Finally, we addressed PC1, synthesizing information to make a patient-centered plan. We explained the guidelines so that residents could provide standard-of-care preventative maintenance for patients.

For the Kern protocol, we identified a lack of general knowledge about the most current ASGE guidelines. Both national and local anecdotal examples underscored the severity of the problem. The original survey confirmed our suspicions that our own institution followed the national trends. The second questionnaire's data demonstrated the efficacy of the tool, with improvements as high as threefold in regard to preprocedure aspirin dosing and twofold in regard to postbleed antithrombotic management. The perceived usefulness of the lecture was also high, with over 81% giving a score greater than 5 out of 10.

Our study has several limitations. While we saw improvement across all tested parameters for medical trainees, chi-square analyses could not be done on the nursing data due to the small sample size. To capture the majority of the house staff, lectures were given during noon conferences across all three campuses. However, attendance at conference was less than 100%, due to residents being on elective rotations, taking vacations, or managing patient emergencies. While lectures can be a meaningful way to discuss an important topic, they are limited by the potential ability to induce both passivity and compliance, and so, learners might not develop an adequate understanding of the topic.<sup>20</sup> Furthermore, a large-scale lecture at noon conference can be a good way to capture the majority of residents, but it may not be the best method of learning for every individual. Some people learn better in a small-group setting or via direct practice. To remedy this, the presentation was very interactive, and the questionnaire was designed to improve retention. Our lectures generated an ongoing conversation between the learners and facilitator, spurring, for instance, a lively discussion of anticoagulation and how it should be managed. A limitation in teaching across different training levels or professions is that the material must be tailored to different learner levels. This issue was of utmost importance while preparing the lectures since the resident presentation contained more advanced information than the nursing talk. The resident PowerPoint included basic information, so medical trainees of all levels could follow the lecture.

Another limitation of this intervention was the usage of a deidentified questionnaire. The posttest results slightly outnumbered the pretest responses. This was most likely due to participants arriving after the start of the lecture. The number of late arrivals was very small and should not have affected the statistical significance of the results. Although we were able to adequately test knowledge recall and provided an educational handout, the survey was based in an artificial classroom setting rather than actual patient care. We attempted to remedy the situation by basing the questions on clinical situations. However, we do not have a method by which to directly survey the future clinical practice of these residents to see if they apply the guidelines properly, which would give a direct assessment of changes in the clinical climate. We were unable to gather statistically significant long-term follow-up due to the low response rate on emailed surveys. A potential future direction could be to aim at directly seeing whether improved knowledge changes practice. Prior to endoscopy, patients could be surveyed on whether they continued their aspirin/NSAIDs prior to the procedure.

Both bleeding and thrombosis have significant morbidity and mortality as well as health care costs. Improper management of antithrombotic agents in the periprocedural period can subject patients to unnecessary risk. Given the national lack of knowledge of ASGE guidelines, it is important to keep educating providers. Data show that continued medical education with lectures both through residency and after training is an important way to keep physicians' knowledge current.<sup>21</sup> Nevertheless, changing practice in a way that will affect patient outcomes may require a multimodal approach, with electronic medical record alerts, handouts, and multiple review sessions.<sup>22</sup> This intervention can serve as a pilot for future educational programs and, when coupled with additional interventions, greatly improve patient care.

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Reported as not applicable.

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