Impact of Pharmacy Student-Led Medication Counseling for New Start Anticoagulants on Patient Outcomes and Healthcare Utilization

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Abstract

Purpose: While there is evidence that pharmacist-led medication counseling improves patient safety and outcomes, there is conflicting evidence of the impact of pharmacy students on patient care outcomes. The objective of this study is to investigate if pharmacy student-led new-start anticoagulant medication counseling has a similar effect on healthcare utilization compared to pharmacist-led new start anticoagulant medication counseling. *Methods:* This study is a multicenter retrospective cohort study. The primary outcome is a composite of unplanned patient contact (phone call or MyChart message) with healthcare providers, emergency department (ED) visits, and hospital readmission within 30 days of discharge. Patients at least 18 years old that are newly started on apixaban, rivaroxaban, or warfarin for a new pulmonary embolism or deep vein thrombosis were included. Student- and pharmacist-led counseling data was collected from seven medical centers in central Texas between January 1, 2022 and June 30, 2023 via chart review on Epic. *Results:* There were 575 patients included in this study. Of these, 165 (29%) patients were counseled by students, 84 (15%) patients were counseled by pharmacists, and 326 (57%) patients were not counseled at all. 440 (77%) patients had unplanned patient contact, ED visit, and/or readmission within 30 days of discharge. There was no difference in all-cause (p = 0.78) or bleeding-related (p = 0.23) composite unplanned patient contact, ED visits, and readmissions within 30 days of discharge between student- and pharmacist-led counseling. *Conclusion:* This study suggests that student-led versus pharmacist-led anticoagulant counseling shows no difference in patient outcomes and healthcare utilization.

Keywords: anticoagulation, medication safety, pharmacy education, transitions of care, medication counseling

Introduction

Medication counseling is crucial in ensuring patient safety and medication adherence. Pharmacists are drug experts, making them the most qualified healthcare professionals to provide patient education. Medication counseling has many benefits, including improved patient outcomes and decreased healthcare utilization. Several studies have shown that pharmacist-led medication counseling significantly increases adherence, reduces hospital readmission rates, and decreases medication-related side effects compared to patients who receive no counseling.[1–5]

The Joint Commission requires that education must be provided for patients and caregivers when new anticoagulant medications are initiated in the inpatient setting.[6] The rationale for this requirement is that anticoagulant counseling reduces the risk of medication-related bleeding and clotting events while improving adherence and reducing harmful drug interactions. Several studies show that pharmacist-led counseling on anticoagulants significantly reduces the incidence of bleeding-related adverse events and hospital readmission rates.[5,7]

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While there is evidence that pharmacist-led medication counseling improves patient safety and outcomes, there is still conflicting data regarding the impact of student-led counseling on clinical outcomes. Much of the literature about pharmacy student involvement in advanced pharmacy practice experiences (APPE) rotations is limited to transitions of care, particularly in medication reconciliation services.[8] While patient education can be a component of medication reconciliation, there is little information on pharmacy student involvement in programs focused exclusively on medication counseling. Involving fourth-year pharmacy students in patient education by training them to independently counsel patients is imperative to meet all standards required by the Accreditation Council for Pharmacy Education (ACPE). Ultimately, this training produces graduates that are confident in their abilities to counsel patients on medications.

Pharmacy students are required to complete 1440 hours of direct patient care in various settings during their APPE rotations. These APPE rotations must be completed before pharmacy students are eligible for licensure after graduation. Medication counseling is a skill taught early in pharmacy school curriculum that fourth-year pharmacy students are equipped to use in all APPE rotations under the supervision of a pharmacist preceptor. The ACPE standards for all PharmD programs require that pharmacy students must be taught to "provide patient-centered care as the medication expert" and "educate all audiences by determining the most effective and enduring ways to impart information and assess understanding."[9] Additionally, the ACPE accreditation standards require that

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APPE rotations are "of the scope, intensity, and duration required to prepare practice-ready graduates."[9]

Objective

Anticoagulant counseling reduces healthcare utilization post-discharge and improves patient outcomes. Utilizing fourth-year pharmacy students and their scope of knowledge to lead inpatient and discharge medication counseling enables students to learn relevant practical skills while allowing pharmacists more time to complete their clinical tasks. The objective of this study is to investigate if pharmacy student-led new-start anticoagulant medication counseling has a similar effect on healthcare utilization compared to pharmacist-led new start anticoagulant medication counseling.

Methods

Study design

This study is a multicenter retrospective cohort study. The primary outcome is healthcare utilization, which is defined as a composite of unplanned patient contact with healthcare providers, emergency department visits, and hospital readmission within 30 days of discharge, both all-cause and bleeding-related. Unplanned patient contact is defined as a patient making a phone call or sending a MyChart message to the prescribing physician. Secondary outcomes are the individual instances of unplanned patient contact and emergency department visits and/or hospital readmissions within 30 days, both all-cause and bleeding related.

Patient eligibility

Inclusion criteria are all patients at least 18 years old that were newly started on apixaban, rivaroxaban, or warfarin for a new pulmonary embolism (PE) or deep vein thrombosis (DVT). Anticoagulants must have been continued upon discharge for at least 30 days. Student-led and pharmacist-led counseling data was collected from seven medical centers across central Texas. Patients that were discharged to long-term care facilities, skilled nursing facilities, or police custody were excluded from this study. Counseling data was collected from all eligible patients as a convenience sample from January 1, 2022 to June 30, 2023. Approval was obtained from the institutional review board before data collection was begun.

Data collection

Data for eligible patients was collected via patient charts on Epic electronic health systems. The information collected included patient name, patient medical record number (MRN), admission diagnosis, hospital location, anticoagulant medication name, dose, frequency, indication, insurance status, medication counsel type (pharmacist or pharmacy student), MyChart message and/or phone calls from patient to prescriber within 30 days of discharge, the reason for contact, emergency department visits within 30 days of discharge and the reason for the visit, and hospital readmissions within 30 days of discharge and the reason for readmission. Patient charts were reviewed on Epic to verify that patients were newly started on apixaban, rivaroxaban, or warfarin and were counseled by a pharmacy student or a pharmacist, which was documented via a pharmacy note. The encounters section on Epic was used to determine if patients had any unplanned contact with providers via MyChart message or phone calls, emergency department visits, or hospital admissions within 30 days of discharge. Detailed instructions on how to complete chart review was outlined, and the researchers who completed the chart review were trained by the principal investigator using these instructions to standardize the chart review and eliminate selection bias as much as possible.

Unplanned patient contact was reported as a binary, where one or more instances of unplanned contact with providers was counted as a single instance of unplanned contact in data collection. Reason for patient contact was reviewed during manual chart review during data collection to ensure contact was for a valid clinical reason. ED visits and hospital readmissions were also reported as a binary, where one or more ED visits and/or hospitalizations was counted as a single instance of hospital utilization in data collection. The composite endpoints of unplanned patient contact, ED visits, and/or hospital readmissions within 30 days was counted as a binary; Any instance of unplanned patient contact, ED visits, or hospital readmission was counted as a single instance of the composite in data collection.

Data analysis

Patient disease state, anticoagulant medication, hospital location, counselor type, and types of healthcare utilization 30 days from discharge were summarized using descriptive statistics. Categorical data, including type of healthcare utilization based on anticoagulant medication, hospital location, and counselor type, was compared using Chi-squared test and Fisher's exact test (alpha = 0.05), and relative risks were calculated. Statistical analysis was performed using RStudio statistical software.

Results

There were 575 total patients included in this study. 730 patients initially met inclusion criteria, but upon chart review, 155 patients were excluded because they met one or more exclusion criteria. The most common reason for exclusion was discharge to long-term care facilities, skilled nursing facilities, or police custody. Of the 575 patients included, 84 were counseled by a pharmacist, 165 were counseled by a student, and 326 did not have documentation that they were counseled by either a pharmacist or student. The majority of the patients included were admitted at Hospital G (n=272, 47%), with the remaining patients admitted at Hospital E (n=129, 22%), Hospital B (n=100, 17%), Hospital D (n=29, 5%), Hospital C (n=28, 4.9%), Hospital F (n=9, 1.6%), or Hospital A (n=8, 1.4%). Most patients were newly initiated on a direct oral anticoagulant (DOAC), with the majority starting on apixaban

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(n=453, 79%) followed by rivaroxaban (n=54, 9.4%). The remaining patients were initiated on warfarin (n=68, 12%). Pulmonary embolism was the most common indication for new start oral anticoagulation (n=397, 69%) versus deep vein thrombosis (n=178, 39%). Most patients counseled by students were counseled at Hospital G (n=151, 92%) with the remaining patients counseled by students at Hospital E (n=14, 8.5%). New start anticoagulant patients at Hospital A, Hospital B, and Hospital F did not have documentation of counseling performed by either a pharmacist or student. Patient characteristics are summarized in tables 1 and 2.

Counseled by pharmacist versus counseled by student

Unplanned patient contact

There were 44 instances (44/84, 52%) of all-cause unplanned patient contact within 30 days in the pharmacist-counseled group and 98 instances (98/165, 59%) of all-cause unplanned patient contact in the student-counseled group (RR 0.85, 95% CI 0.64-1.14). Of the instances of unplanned patient contact that were bleeding-related, one was counseled by a pharmacist (1/84, 1.2%) and two were counseled by students (2/165, 1.2%) (RR 0.98, 95% CI 0.09-10.7).

ED visits and hospitalizations

There were 26 instances (26/84, 31%) of all-cause ED visits and/or hospital readmissions within 30 days in the pharmacist-counseled group and 45 instances (45/165, 27%) of all-cause ED visits or hospital readmissions within 30 days in the student-counseled group (RR 1.05, 95% CI 0.89-1.25). Of the ED visits and/or hospital readmissions that were bleeding-related, three were counseled by a pharmacist (3/84, 3.6%) and one was counseled by a student (1/165, 0.6%) (RR 5.89, 95% CI 0.62-55.8).

Composite outcome

The all-cause composite primary outcome occurred in 58 patients counseled by a pharmacist (58/84, 69%) versus 111 patients counseled by a student (111/165, 67%) (RR 1.03, 95% CI 0.86-1.21). The bleeding-related composite primary occurred in four patients counseled by a pharmacist (4/84, 4.8%) versus three patients counseled by a student (3/165, 1.8%) (RR 2.63, 95% CI 0.60-11.1). These outcomes, grouped by whether patients were counseled by a pharmacist versus counseled by a student, are detailed in table 3.

Counseled by pharmacist or student versus not counseled

Unplanned patient contact

There were 142 instances (142/249, 57%) of all-cause unplanned patient contact within 30 days in the group counseled by either a pharmacist or student and 152 instances (152/326, 47%) of all-cause unplanned patient contact in the group counseled by neither (RR 1.24, 95% CI 1.04-1.48). Of the instances of unplanned patient contact that were bleeding-related, three were counseled by a pharmacist or student (3/249, 1.2%) and nine were counseled by neither (9/326, 2.8%) (RR 0.43, 95% CI 0.12-1.60).

ED visits and hospitalizations

There were 71 instances (71/249, 29%) of all-cause ED visits and/or hospital readmissions within 30 days in the group counseled by a pharmacist or student and 75 instances (75/326, 23%) of all-cause ED visits or hospital readmissions within 30 days in the group counseled by neither (RR 1.08, 95% CI 0.98-1.19). Of the ED visits and/or hospital readmissions that were bleeding-related, four were counseled by a pharmacist or student (4/249, 1.6%) and eight were counseled by neither (8/326, 2.5%) (RR 0.65, 95% CI 0.70-2.15).

Composite outcome

The all-cause composite primary outcome occurred in 169 patients counseled by a pharmacist or student (169/249, 68%) versus 181 patients counseled by neither (181/326, 56%) (RR 1.22, 95% CI 1.07-1.39). The composite primary outcome of bleeding-related unplanned patient contact, ED visits, and/or hospital readmission within 30 days occurred in seven patients counseled by a pharmacist or student (7/249, 2.8%) versus 17 patients counseled by neither (17/326, 5.2%) (RR 0.54, 95% CI 0.23-1.28). These outcomes, grouped by whether patients were counseled by a pharmacist or student versus not counseled, are detailed in table 4.

Discussion

In this multicenter retrospective cohort study, there was no statistically significant difference in the composite primary outcomes between patients counseled by a pharmacist versus student. Additionally, there was no statistically significant difference in each individual outcomes (all-cause or bleeding-related) between patients counseled by a pharmacist versus student.

While completing chart review for this study, we discovered that a large proportion of the patients included were not being counseled by a pharmacist or student at all. This discovery allowed us to compare healthcare utilization in patients who were counseled by a pharmacist or student to patients who were counseled by neither. This analysis was not planned prior to beginning data collection for this study; however, this additional data and the associated findings strengthen our conclusions when comparing the outcomes of student-counseled patients versus pharmacist-counseled patients. Surprisingly, patients counseled by a pharmacist or student had significantly more unplanned contact with providers and unplanned healthcare utilization than patients counseled by neither.

Importantly, this increase was not in ED visits or readmission rates, but rather patient-initiated messages to providers via MyChart. There are many possible reasons why patients counseled by a pharmacist or student had higher healthcare

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utilization than patients not counseled by anyone. One possibility is that patients who were not counseled were not told what signs or symptoms related to anticoagulant use would warrant contacting a physician. One of the main counseling points covered by pharmacists and students is when to contact their physician for major and minor bleeding-related adverse effects. Patients who were not counseled on what to do if they experienced bleeding-related symptoms may not have known that their symptoms warranted contacting their physician. Another possibility is that patients counseled by pharmacists and students were better informed and felt more equipped to manage their own health, empowering these patients to have increased communication with their providers.

In contrast, patients counseled by a pharmacist or student had numerically fewer bleeding-related unplanned contact, ED visits, and hospital readmissions, both individually and as a composite, but this difference was not statistically significant. Overall, the incidence of bleeding-related unplanned healthcare contact was low in both groups. This study is likely underpowered and a larger sample size would be necessary to detect a significant difference between counsel and no-counsel groups, but the trend identified in this study is promising and reinforces the results of previous studies.

Zdyb et al. implemented a pharmacist-led counseling initiative, where patients newly started on anticoagulants in the ED were counseled by a pharmacist upon discharge. In the group not counseled by pharmacists on discharge, there was nearly a ten-fold increase in anticoagulation-related ED visits and readmissions within 90 days when compared to the group counseled by pharmacists on discharge.[7] Wilhem et al. described a student-led anticoagulant counseling service pilot program that found decreased all-cause and bleeding-related readmissions in the group counseled by students versus not counseled.[10] Low bleeding events in our study could potentially be attributed to the number of patients receiving apixaban relative to warfarin, and may also explain why the current study did not find a statistical difference in this outcome in contrast to older studies where warfarin was the dominant anticoagulant used.

Our study demonstrates that pharmacy leadership can confidently task pharmacy students with the responsibility of anticoagulant discharge counseling with similar outcomes as their pharmacist counterparts. Hospital G has a structured program in place designed to prepare APPE students for reviewing discharge medications and counseling new start anticoagulants and antiplatelets. This training includes a lecture portion, shadowing a pharmacist or an already trained student, and witnessed solo counseling prior to independently counseling. Additionally, APPE students at Hospital G counseled on all new-start anticoagulants during normal business hours seven days per week. The only reason a pharmacist would counsel on a new-start anticoagulant would be if they were discharged during hours that students were not present at the hospital. This meant that students were counseling patients with a wide range of medical history complexity and health literacy. For the other hospitals within the health system that do not have structured counseling programs in place for students, it is unclear if there are specific criteria for when pharmacists would counsel patients instead of students.

Our study provides new evidence that pharmacy student-led counseling is of equal efficacy compared to pharmacist counseling. Hospitals that have APPE students should strongly consider implementing student-led counseling programs focused on new-start anticoagulants in the inpatient setting. Although this approach requires an initial upfront investment of pharmacist time in training, student-led anticoagulant counseling has the potential to reduce bleeding-related adverse events, prepares APPE students to be practice-ready upon graduation, and allows pharmacists to spend more time on clinical tasks that students are unable to complete. Furthermore, patients who were counseled had higher rates of unplanned contact via MyChart or phone call rather than visiting the ED. This can also reduce the burden of healthcare usage on emergency departments and providers as well.

There are several limitations to this study. First, this study was retrospective in nature, so the strength in evidence presented is less than a prospective cohort study or randomized trial. Another limitation is that the way that adverse events were measured and how unplanned healthcare utilization was defined may not have captured all adverse events that patients experienced, as it was dependent on if the patient communicated with their care team via the provided communication channels within the electronic health system. Pharmacy students receiving standardized counseling training are instructed to inform the patient to reach out to their physician should they experience bleeding complications after discharge. This standardized instruction is not present for pharmacists practicing at Hospitals A-F or for non-pharmacist healthcare workers providing counseling. Patients who were counseled at a Hospitals A-F or not counseled at all may not have been instructed to report adverse events and would therefore go uncaptured in these groups.

Additionally, differences in baseline characteristics, patient acuity, andreadmission risk were not accounted for when analyzing the data.This could bias the results against student-led counseling, as Hospital G has the highest patient acuity in the area and is where most student-led counseling occurred. Despite this, our findings suggest that healthcare resource use is similar with student-led counseling versus pharmacists. We did not consider any patient-reported adverse events during the study period that may have occurred but were not associated with a phone call, myChart message, ED visit, or readmission. Additionally, only the encounters that could be seen on a patient's profile in Epic were used to measure

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healthcare utilization. While outside healthcare data can be seen on Epic, there is no way to ensure that all outside healthcare data was captured on Epic and identified during chart review. The beginning of the study period also overlapped with the first Omicron wave of the COVID-19 pandemic, which likely impacted how patients were utilizing healthcare. Patients may have been avoiding going to the doctor or ED for fear of exposure to COVID-19, or they may have been contacting providers or visiting the ED more frequently due to being infected with COVID-19. This likely confounder was not accounted for in this study

An opportunity for future research is expanding the inclusion criteria of patients involved in this study. We only focused on patients with new-onset PE/DVT that were started on apixaban, rivaroxaban, or warfarin. We did not include any other indications for anticoagulation, such as atrial fibrillation, prosthetic heart valves, etc., or other types of less commonly used anticoagulants, like dabigatran, enoxaparin, or fondaparinux. Anticoagulant dosing for indications other than VTE treatment is much more variable, so in order to limit the variability in dosing and bleed risk, anticoagulant indication was limited to PE and DVT. Additionally, VTE dosing for apixaban and rivaroxaban is not adjusted for renal or hepatic impairment, compared to other DOACs or enoxaparin. We also did not look at any concurrent antiplatelet use, such as low-dose aspirin or P2Y12 inhibitor use in addition to anticoagulants.

These factors can change the risk of adverse events, especially bleeding-related adverse events. Broadening the inclusion criteria of patients to include additional indications and anticoagulant medications will help generalize this study's conclusions to a larger population. Additionally, including a more comprehensive group of patients will allow for subgroup analysis and comparison between hospital sites, which we were unable to calculate due to insufficient data. This will likely provide greater insights into factors that could exacerbate both all-cause and bleeding-related adverse events to better tailor counseling efforts to the highest-risk patient subgroups.

In addition to the changes suggested above for future research, exploring the reasons for which patients reached out via MyChart may give more nuance into how pharmacy interactions with patients shape patients' subsequent interactions with the healthcare system. In our case, the increased healthcare utilization with increased messaging may reflect increased patient-ownership over their wellbeing. While the way we defined healthcare utilization was justified given the scope and timeline of this study, it was not the most comprehensive way to identify adverse effects related to patients counseled by pharmacists and students or neither. While it is promising that there was no difference in healthcare utilization between patients counseled by pharmacists versus students, broadening the way healthcare utilization is defined will further uncover reasons why patients counseled by a pharmacist or student may be utilizing healthcare resources more frequently than patients counseled by neither.

Conclusion

The results of this study suggest that student-led versus pharmacist-led anticoagulant counseling shows no difference in patient outcomes and healthcare utilization. Hospitals that provide rotations for fourth-year pharmacy students should consider implementing student-led anticoagulant counseling. Such programs grant pharmacy students the opportunity to gain valuable experience while educating patients with comparable outcomes to pharmacists while also allowing pharmacists more time to perform clinical tasks.

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Table 1. Baseline patient characteristics

Characteristic	**N = 575 (%)**
Counselor type	
No counsel	326 (57%)
Pharmacist	84 (15%)
Student	165 (29%)
Indication	
Deep vein thrombosis	178 (39%)
Pulmonary embolism	397 (69%)
Medication	
apixaban	453 (79%)
rivaroxaban	54 (9.4%)
warfarin	68 (12%)
Patient location	
Hospital A	8 (1.4%)
Hospital B	100 (17%)
Hospital C	28 (4.9%)
Hospital D	29 (5.0%)
Hospital E	129 (22%)
Hospital F	9 (1.6%)
Hospital G	272 (47%)

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Table 2. Patient location by hospital stratified by counselor type

Patient location	No counsel (N=326)	Pharmacist (N=84)	Student (N=165)
Hospital A	8 (2.5%)	0 (0%)	0 (0%)
Hospital B	100 (31%)	0 (0%)	0 (0%)
Hospital C	18 (5.5%)	10 (12%)	0 (0%)
Hospital D	21 (6.4%)	8 (9.5%)	0 (0%)
Hospital E	103 (32%)	12 (14%)	14 (8.5%)
Hospital F	9 (2.8%)	0 (0%)	0 (0%)
Hospital G	67 (21%)	54 (64%)	151 (92%)

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Table 3. Student-counseled vs. pharmacist-counseled outcomes

Characteristic	Pharmacist (N=84)	Student (N=165)	P-value	Relative risk	95% Confidence interval
30-day unplanned contact			0.29	0.85	0.64-1.14
30-day contact	44 (52%)	98 (59%)			
No contact	40 (48%)	67 (41%)			
30-day unplanned contact bleeding related			1.00	0.98	0.09-10.7
Bleeding related	1 (1.2%)	2 (1.2%)			
No contact/not bleeding related	83 (99%)	163 (99%)			
30-day readmission/ED visit			0.54	1.05	0.89-1.25
Readmit/ED visit	26 (31%)	45 (27%)			
No readmit/ED visit	58 (69%)	120 (73%)			
30-day readmission/ED visit bleeding related			0.11	5.89	0.62-55.8
Bleeding related	3 (3.6%)	1 (0.6%)			
No readmit/ED visit or not bleeding related	81 (96%)	164 (99%)			
30-day any healthcare utilization			0.78	1.03	0.86-1.21
Yes	58 (69%)	111 (67%)			
No	26 (31%)	54 (33%)			
30-day any healthcare utilization bleeding related			0.23	2.63	0.60-11.1
Yes	4 (4.8%)	3 (1.8%)			
No	80 (95%)	162 (98%)			

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Table 4. Counseled by pharmacist or student vs. not counseled outcomes

Characteristic	Any counsel (N=249)	No counsel (N=326)	P-value	Relative risk	95% Confidence interval
30-day unplanned contact			0.013*	1.24	1.04-1.48
30-day contact	142 (57%)	152 (47%)			
No contact	107 (43%)	174 (53%)			
30-day unplanned contact bleeding related			0.21	0.43	0.12-1.60
Bleeding related	3 (1.2%)	9 (2.8%)			
No contact/not bleeding related	246 (99%)	317 (97%)			
30-day readmission/ED visit			0.13	1.08	0.98-1.19
Readmit/ED visit	71 (29%)	75 (23%)			
No readmit/ED visit	178 (71%)	251 (77%)			
30-day readmission/ED visit bleeding related			0.48	0.65	0.70-2.15
Bleeding related	4 (1.6%)	8 (2.5%)			
No readmit/ED visit or not bleeding related	245 (98%)	318 (97%)			
30-day any healthcare utilization			0.003*	1.22	1.07-1.39
Yes	169 (68%)	181 (56%)			
No	80 (32%)	145 (44%)			
30-day any healthcare utilization bleeding related			0.15	0.54	0.23-1.28
Yes	7 (2.8%)	17 (5.2%)			
No	242 (97%)	309 (95%)			

*statistically significant

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