Health care provider use of motivational interviewing to address vaccine hesitancy in college students

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ABSTRACT

Background: Vaccine-preventable diseases significantly influence the health and academic success of college students. Despite the known negative impact of these diseases, vaccination rates routinely fall short of national goals and recommendations. Although vaccination decisions are complex, a recommendation from a health care provider is one of the key motivators for individuals receiving a vaccine. Motivational interviewing (MI), a counseling approach primarily used to address substance abuse, can be applied to other health-related behaviors.

Local Problem: Despite previous quality improvement efforts aimed at increasing vaccine rates for influenza, human papillomavirus (HPV), and meningitis B (MenB), vaccinations at large university health centers have been well below benchmarks set by Healthy People 2020.

Methods: This study was guided by the Theory of Planned Behavior and included MI training and regular reinforcement for health care providers to address vaccine hesitancy with college students.

Results: Influenza vaccination rates improved, but HPV vaccine rates remained stable and MenB vaccine rates decreased compared with the previous year. Clinicians demonstrated a significant increase in knowledge of MI techniques after a targeted educational intervention. Repeat measures indicate the potential for sustained improvement when ongoing reinforcement is provided.

Conclusion: MI can be an effective part of a strategy to increase vaccination rates.

Keywords: College health; immunization; motivational interviewing; theory of planned behavior; vaccination.

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Introduction

Problem description

Vaccine-preventable diseases including influenza, human papillomavirus (HPV), and meningitis B (MenB) have a significant impact on the health and academic progress of college students. Despite a body of research related to the importance of these vaccines, many college students do not receive the recommended vaccinations, resulting in both short- and long-term consequences. Influenza can directly affect student success because students who contract the virus experience greater rates of absenteeism (National Foundation for Infectious Disease, 2016; Nichol, D'Heilly & Ehlinger, 2005). Human papillomavirus, the most common sexually transmitted infection, has been linked to nearly 34,000 cases of cancer each year (HPV Vaccination for Cancer Prevention, 2018). Meningitis, although rare, can pose a significant threat to morbidity and mortality (Centers for Disease Control and Prevention [CDC], 2017). College students, in particular, are at an increased risk for meningitis as compared with their noncollege peers (Mbaeyi et al., 2019).

Healthy People 2020 set the benchmark for annual influenza vaccination rates at 70% (Office of Disease Prevention and Health Promotion [ODPHP], 2019). In the United States, flu vaccination coverage rates declined during the 2017–2018 flu season; only 26.9% of adults aged 18–49 years were vaccinated (CDC, 2018a). Poehling, Blocker, Ip, Peters, and Wolfson (2012) sampled eight universities during the 2009–2010 flu season and found a mere 20% of students had been immunized against influenza.

The Healthy People 2020 goal for HPV vaccination is 80% (ODPHP, 2019). Human papillomavirus vaccination rates have improved over the past 5 years, yet still fall short of the goal, with rates lower than other vaccines recommended for adolescents. In 2017, only 53% of

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female students and 44% of male students in the United States had received the recommended doses of the HPV vaccine by age 17 (Walker et al., 2018). Many studies indicate that college students have not received or have not completed the HPV vaccine series (Dempsey, Cohn & Dalton, 2011; Williams et al., 2014).

Healthy People 2020 goals related to meningococcal disease are focused on decreasing the number of laboratory-confirmed cases for all serogroups of meningitis. Currently, there are no coverage estimates for the MenB vaccine; however, preliminary data from Advisory Committee on Immunization Practices indicate coverage for 16- to 18-year-olds is less than 10% (Meyer, 2018). Meningitis B is of particular concern due to a number of recent outbreaks on college campuses (CDC, 2017) and because of an increased risk to college students compared with their same aged peers (Mbaeyi et al., 2019).

Vaccination trends in the local university health center have been similar to national trends. Throughout the 2016–2017 academic year less than 20.4% of eligible patients received the flu vaccine at the clinic although an additional 16.9% self-reported receiving the vaccine from an outside source. During this time, 1.3% of eligible students received one dose of the MenB vaccine and 4.8% of eligible students received at least one HPV vaccine. HPV and MenB vaccination rates on campus do not account for students who received these vaccines before matriculation or outside of the university health center.

Specific aims

Motivational interviewing (MI) techniques have proven effective for a number of health-related behaviors (Dempsey & O'Leary, 2017). Recommendation from a health care provider is often cited as a key reason for vaccine uptake, although vaccine hesitancy remains a significant concern (Rahman, Laz, McGrath, & Berenson, 2015). The purpose of this article is to describe a quality improvement project aimed at health care provider use of MI as part of a health center immunization strategy at a large southwestern university.

Background and significance

Influenza can have a significant impact on student academic performance. On a national level, during the 2015–2016 flu season, influenza resulted in 11 million medical visits, 310,000 hospitalizations and 12,000 deaths (Rolfes et al., 2016). College students with influenza will miss, on average, an additional 8 days of class or work compared with influenza-free colleagues (Nichol et al., 2005). Students missing class may not be able to successfully complete required coursework impacting grades, retention, and graduation rates. In addition, influenza is virulent and can spread rapidly with outbreaks reported as high as 73% among subgroups of college students (Benjamin & Bahr, 2016), leading to increased risk for the entire university community.

Although influenza impacts are most often noted immediately, the delayed onset repercussions from HPV are no less severe. Human papillomavirus-related cancers can have lifelong consequences. The National Cancer Institute reports that HPV is responsible for nearly all cervical cancers, 70% of oropharyngeal cancers, 90% of anal cancers, 60% of penile cancers, 75% of vaginal cancers, and 70% of vulvar cancers. In the 8 years after the introduction of the HPV vaccine, the prevalence of cervical cancer dropped 61% among 20- to 24-year-olds, and a decrease in the 4vHPV-type, even amid those who are unvaccinated, suggesting herd immunity (McDaniel et al., 2017).

Although less common, those infected with meningitis often die or suffer with significant lifelong complications. According to the CDC (2017), there were 350 cases of meningococcal disease in 2017, a greater proportion of which are college students (Mbaeyi et al., 2019). Meningitis is fatal in 10% of cases. Of those who survive, 20% live with a permanent disability (CDC, 2017).

Although health care providers focus on the clinical impact of influenza, HPV, and MenB, it is equally important to consider the cost of treating these vaccine-preventable diseases. Mao, Yang, Qiu, and Yang (2012) calculated that in 2010 the direct cost for treating influenza was greater than $10 million, with a total economic cost of more than $29 million. Most of this cost is indirect, related to lost productivity. Owusu-Edusei et al. (2013) estimated the overall incidence cost of HPV in a given year as $1.7 billion. Ortega-Sanchez et al. (2008) calculated a 10-year herd immunity-focused vaccination program for MenB would save the United States up to $551 million in direct health care costs.

Rationale

First introduced in 1983 as a method of brief intervention to promote behavior change for patients with alcohol use disorders, MI has been, from the outset, focused on guiding a patient to activate her or his own motivation for change. In the 1990s, MI use expanded accompanied by research demonstrating efficacy for a number of additional health risk behaviors. (Rollnick, Miller, & Butler, 2008). As we reviewed the literature, our team questioned how MI could be used to improve vaccination rates because this strategy was being used for other health behaviors within our organization. Of central concern for this study was research demonstrating effectiveness of MI in college health (Fleming et al., 2010; Kazemi, Levine, Dmochowski, Shou, & Angbing, 2013) and a 2018 study by Dempsey et al. linking MI research to vaccine research and, more specifically, a demonstrated increased adolescent vaccination rates for HPV when using MI to address vaccine hesitancy with parents. These links between Motivational Interviewing (MI), college health, and vaccination helped to lay the groundwork for this Quality Improvement (QI) effort.

Methods

Context

The setting for this evidence-based QI intervention was a large public university in the southwest. The health center provides services for students, faculty, and staff at the University with a focus on the student population. In June 2018, clinicians were encouraged to attend two separate 4-hr sessions of MI education as part of a wider university initiative to address alcohol and drug use on campus. This created an opportunity to leverage the use of MI to address vaccine hesitancy. Through an open-innovation design, information was shared between the two initiatives allowing clinicians to use information and techniques from both sources to advance their MI knowledge and skills.

Interventions

The intervention design was based on Azjen's (1991) theory of planned behavior (TPB). Although the TPB is most often used in work with individual patients, it can also be used as an implementation model for evidence-based practice (Burgess, Chang, Nakamura, Izmirian, & Okamura, 2017). The theory links behavioral beliefs, normative beliefs, and control beliefs with intention leading to behavior change. This intervention addressed all aspects of the TPB through a series of scheduled interactions with clinical staff and feedback provided at regular intervals regarding the number of vaccines administered. **Figure 1** is a logic model for the intervention detailing the timeline of actions, concurrent university events, and a connection to the TPB elements.

- Behavioral beliefs, as described by Azjen (1991) link behavior to the expected outcome. These beliefs were addressed initially with formal education sessions and then reinforced at monthly staff meetings and by email with explicit connections between the use of MI and vaccine discussion.
- Normative beliefs (Azjen, 1991) are perceived behavioral expectations. Clinicians were updated throughout the fall semester with current rates of vaccination compared with previous calendar years with the goal of normalizing vaccine discussions as part of routine care in the college health setting.
- Control beliefs (Azjen, 1991) are the perceived factors that facilitate or impede performance. These were addressed by evaluating process issues at monthly staff meetings and through informal conversations with staff members regarding individual clinical encounters and vaccine discussions.

The vaccine QI study began in early July when clinical staff including nurse practitioners, physicians, and

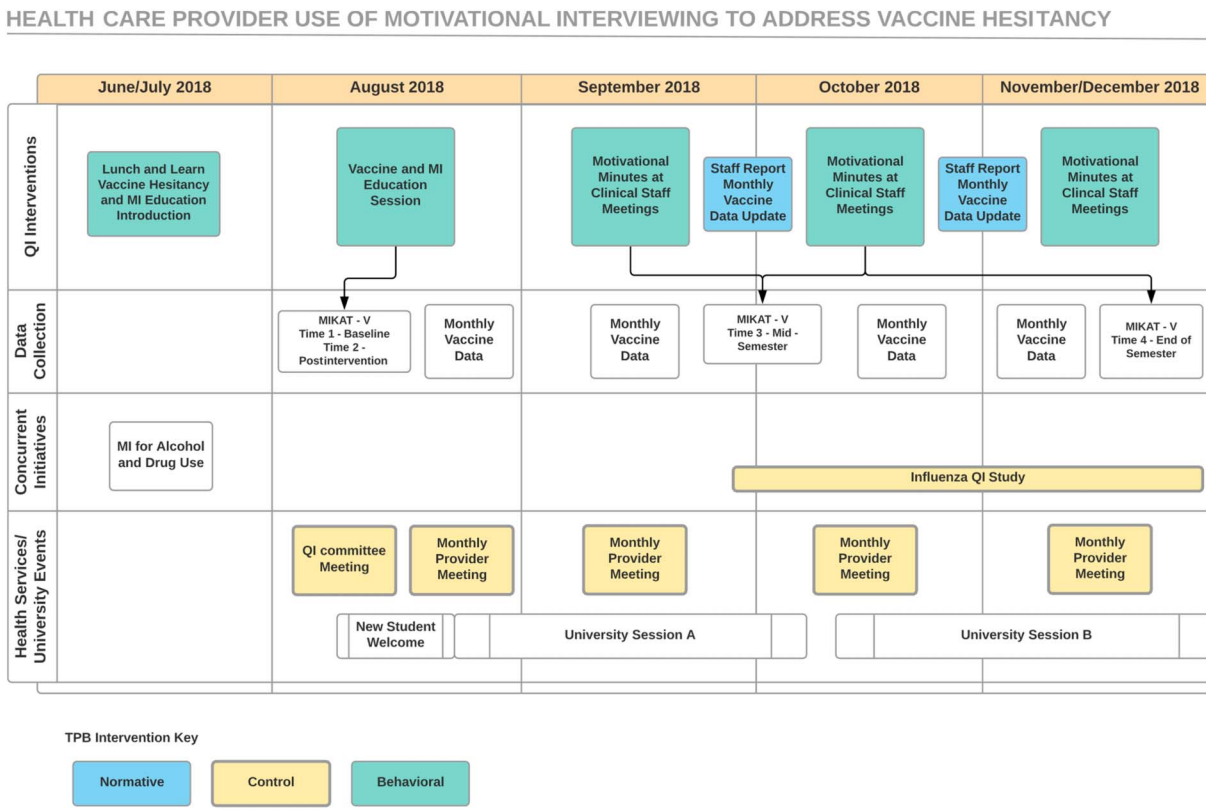

Figure 1. Logic model of quality improvement study. MI = motivational interviewing; MIKAT-V = MI knowledge for addressing vaccine hesitancy; TPB = theory of planned behavior.

registered nurses attended a lunch and learn session regarding vaccine hesitancy that included a refresher on the use of MI techniques. In August, these clinicians were invited to attend a one-hour educational session to review vaccine data and learn how MI could be used to address vaccine hesitancy. This session made an explicit connection between the QI study and previous MI education sessions. **Figure 2** provides an outline for the educational session based on the work of Dewey et al. (2018), advocating for a presumptive approach to vaccine recommendations followed by the use of MI to address vaccine hesitancy. In addition to this training, MI congruent strategies were reinforced in motivational minutes at monthly staff meetings and through targeted monthly email messaging.

Measures

The primary outcome of interest was the number of vaccines given as compared with the previous year. Three vaccines, influenza, HPV, and MenB, were tracked through an internal database of vaccines compiled from the electronic medical record using cost center ID numbers.

The antecedent outcome was MI knowledge. With the original author's permission (Leffingwell, 2006), the MI Knowledge Assessment Test was modified to measure MI knowledge for addressing vaccine hesitancy (MIKAT-V). Content validity of the 28-item adapted tool was reviewed by six MI experts. All adapted items were rated as relevant or extremely relevant by more than 80% of the reviewers.

The MIKAT-V was administered 4 times throughout the semester: as a pretest and posttest at the time of the August educational session, and repeated in late October and late December. Data were gathered to track retention of information and for formative assessment to guide ongoing MI reinforcement.

Analysis

Vaccine rates were calculated by the total number of vaccines given and as the number of vaccines given specifically to students.

Knowledge scores were entered into SPSS (IBM Corp. Released 2016. IBM SPSS Statistics for Windows, Version 24.0. Armonk, NY.). A total of 19 clinicians completed the pretest and posttest at the August information session. Ten clinicians completed the follow-up assessment and 13 completed the final assessment. A total of six participants completed the MIKAT-V at all four intervals.

Ethical considerations

This study was reviewed and determined to be exempt by the university's Institutional Review Board.

Results

Primary outcome: vaccination rates

The number of influenza vaccines given increased by 19.71% from the fall of 2017 to the fall of 2018 (**Figure 3**). Influenza vaccines given to students increased by 22.74%. The number of HPV vaccines decreased by 2.84% during this time frame, student-specific data showed a decrease

Educational Session Outline

Topic	Description	Goal	TPB Connection
Pretest	Enrollment information and pretest		Normative
Vaccine Information Overview	Vaccine fact matching activities	Describe the important features of each vaccine (cognitive – understand) Describe why vaccines are important (affective – receiving)	Normative
Presumptive Approach	Overview of presumptive approach • Power point presentation • Presumptive approach discussion	Evaluate the strengths of the presumptive approach compared to their current practice (affective-valuing). Identify situations in which the presumptive approach could be appropriate. (affective – responding)	Normative
MI to Address Vaccine Hesitancy	Part 1: Review of MI approaches as applied to vaccines. • OARS strategy review(**O**pen ended questions, **A**ffirm, **R**eflective listening, **S**ummarize) • RULE core principles review (**R**esist the righting reflex, **U**nderstand, **L**isten with empathy, **E**mpower) • Share and write down with partner	Explain how MI techniques can be applied to a vaccine discussion (cognitive, understand) Share an example of when they have used an MI approach for any health behavior (affective – valuing)	Behavioral
	Part 2: Video Examples • Video examples • What MI techniques did you see? • Where are the pitfalls?	Critique the use of MI to address vaccine hesitancy. (Cognitive – evaluate) Propose a way in which they could incorporate MI into their vaccine discussion (Affective – organizing)	Normative Behavioral
Health Services Process	Overview of additions to Heath Services Process including: • New patient paperwork • VIS (Vaccine Information Statement) forms	Use patient history form and VIS forms as part of their vaccine discussion.	Control
Brief Practice	Scenario-based discussion with prompts for patient and provider	Discuss vaccines using 1 MI technique (cognitive-manipulation) Integrate use of MI into vaccine discussions. (affective – organizing)	Control Behavioral
Posttest	MIKAT-V • MIKAT-V posttest		Normative Behavioral Control

Figure 2. Educational session outline with objectives. MI = motivational interviewing.

of 2.67%. Meningitis B vaccines given to students or staff decreased by 67.23% in 2018 as compared with 2017.

Antecedent: motivational interviewing knowledge

A total of 19 clinical staff members participated in the initial education session. The group comprised nine nurse practitioners, seven physicians, and three registered nurses. A paired-sample *t*-test was conducted to compare the mean pretest and posttest scores on the MIKAT-V. There was a significant increase in the scores for the pretest (M = 20.57, SD = 2.6) and posttest (M = 22.52, SD = 2.67); $t(-3.302)$, $p = .004$.

A total of six clinicians completed the MIKAT-V at all four intervals. This included three nurse practitioners, one physician, and two registered nurses. A nonparametric Friedman test of differences rendered a Chi-square value of 5.291 which was not significant ($p = .152$). The mean longitudinal MI knowledge score improved from 19 of a possible 28 (68%) at baseline to 22 of 28 (79%) during the final test. The greatest increase in score was noted between the pretest and posttest during the first educational session.

Discussion

Summary

Motivational interviewing knowledge scores increased in a statistically significant manner when comparing pretest and posttest scores from the initial educational session. **Figure 4** highlights changes in mean score based on number of MI training sessions attended for alcohol use behaviors. Fifty percent of the participants at the August education session had already participated in the 8 hours of MI education (two four-hour sessions) provided earlier in the summer. Ninety percent had attended at least 4 hours of previous MI training. Mean scores for those who had only one previous session increased the most. The highest scores were seen in those who participated in two previous sessions of MI education before the vaccine-focused educational session. The data suggest that repeated exposure to MI training leads to statistically significant improvements in MI knowledge.

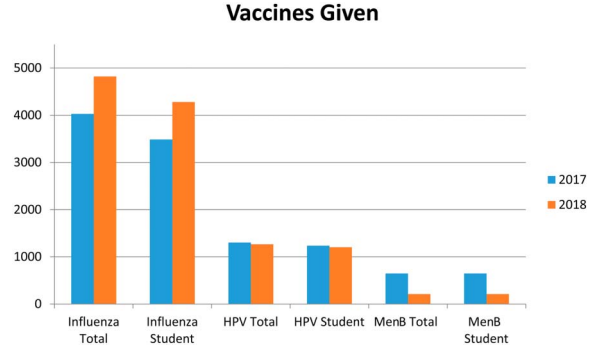

Figure 3. Graph of vaccines given. HPV = human papillomavirus; MenB = meningitis group B.

A longitudinal evaluation of the six individuals who completed the MIKAT-V at all four time periods shows mixed results. See **Table 1** for descriptive statistics. The trend demonstrates a small increase in mean scores throughout the QI initiative. The largest gains were noted between the pretest and the posttest. Further analysis of the longitudinal data indicates the largest gains in knowledge for those who had not attended a previous training session. All participants had an improvement in scores when comparing pretest with the final evaluation result.

Vaccines rates for influenza increased during this intervention, whereas HPV vaccine rates remained stable and MenB vaccine rates decreased. The largest number of influenza vaccines was given in October and November of both years and followed a similar trend line in 2017 and 2018. Influenza vaccines are highlighted each year starting in October as part of an annual influenza quality improvement initiative. HPV vaccine rates also followed a similar trend line compared with the previous year. Meningitis B vaccines decreased compared with the previous year. The greatest number of MenB vaccines was given in August of both years.

Interpretation

The educational session specifically linking MI to vaccines significantly improved participant knowledge from the pretest to posttest. Furthermore, the data show an apparent trend of maintained knowledge regarding MI among participants that can be provisionally established to ongoing reinforcement. The longitudinal study indicates that despite not attending a formal MI training session, clinicians were able to achieve scores similar to those with 8 hours of training in advance of the QI study. These results also suggest that although an educational intervention leads to higher initial scores, ongoing reinforcement is equally important. The MI literature recommends ongoing training and reinforcement as part of developing an MI approach. This QI study demonstrates that this can be done through intentional contacts on a monthly basis. The TPB provides the foundation for an evidenced-based design that ensure that normative, control, and behavioral beliefs are addressed as part of changing clinician intention and behavior.

Flu vaccines consistently increased throughout the study period when compared with the previous year. In addition to education provided about the use of MI in vaccine discussions, clinicians received monthly updates regarding the number of vaccines administered in comparison to previous years. This was done to address the normative domain establishing the practice of addressing vaccine status as a part of all visits.

The data regarding HPV and meningitis did not follow a similar trend. The current electronic medical record and incoming vaccine data-gathering process poses some

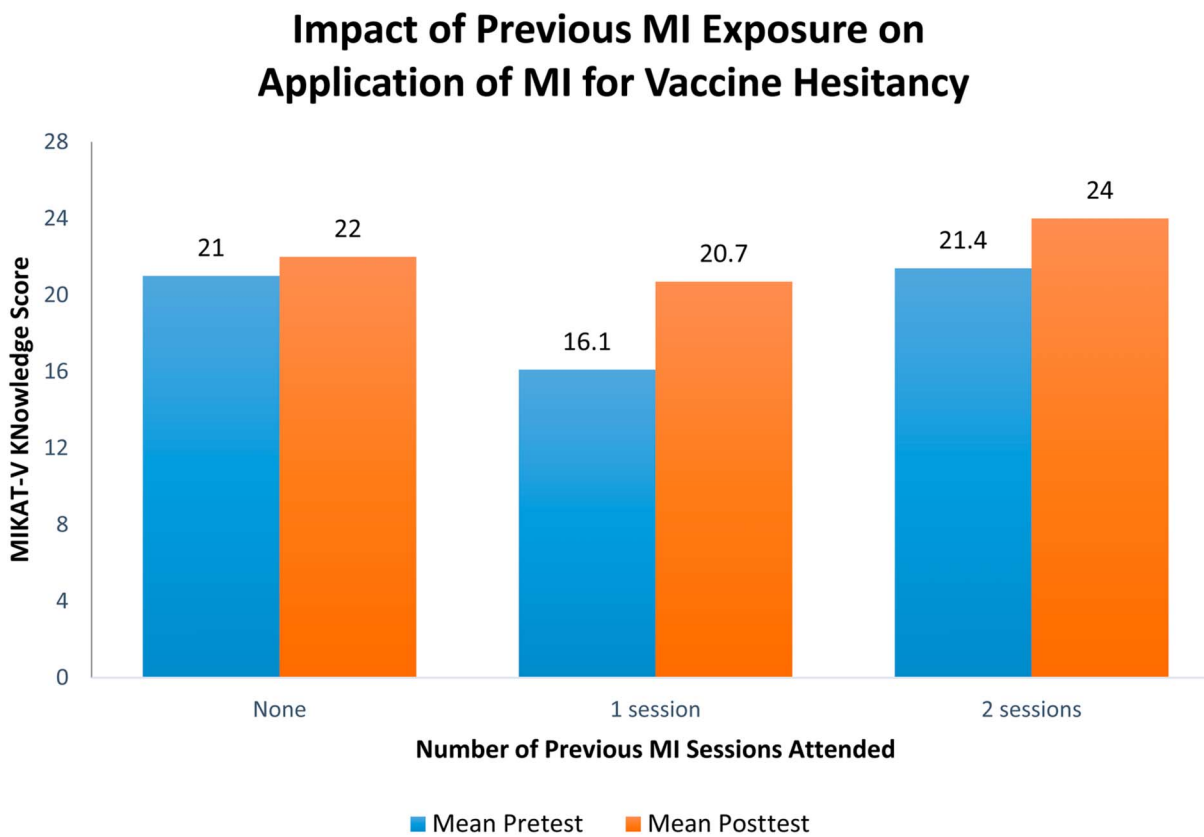

Figure 4. Impact of previous MI exposure on application of MI for vaccine hesitancy. MI = motivational interviewing.

specific limitations for the collection of data related to these vaccines. Although influenza vaccines are given yearly and easily trackable in the electronic medical record, the HPV and MenB series are recommended for completion before arrival on campus. The university does not currently require students to have these vaccines; therefore, most vaccine records are incomplete at the time of patient visits to the health center. College students often do not know which vaccines, if any, they have received. This significantly affects control beliefs, factors that facilitate performance, because clinicians are unsure if the vaccine should be recommended and students are unsure if they should receive it. Improved data gathering of student vaccine history could improve control behaviors and vaccination rates for both MenB and HPV. The low number of MenB vaccines given may also be related to more students receiving the vaccine series before attending college as recommended on national immunization schedules.

Table 1. Longitudinal Data

	N	Minimum	Maximum	Mean	SD
Pretest	6	17.00	21.00	19.0000	1.41421
Posttest	6	19.00	26.00	21.1667	2.48328
Follow-up	6	19.00	24.00	21.3333	2.25093
Final	6	19.00	25.00	22.0000	2.52982
Valid *N*	6				

Limitations

The study had a number of limitations. First, this effort was one aspect of the overall vaccine strategy for the university health center. Other initiatives (as noted in **Figure 2**) may have affected vaccine rates. In addition, because of a severe influenza season in 2017–2018, patients may have been more likely to request the flu vaccine. The CDC noted an increase in early flu vaccine rates for the 2018–2019 season (CDC, 2018b).

Although 19 participants participated in the initial pretest and posttest, only six completed the knowledge test at all four time periods. This may indicate a waning of interest during the study, and could also be due to a change in clinical staff during the same time period. The small number of participants who completed all data measures over the course of the project may have affected the ability to reach a point of statistical significance despite the improvement in scores.

This study was also limited by historical vaccine data for the HPV and MenB series are routinely given before

matriculation. The current electronic medical record does not track historical vaccinations. Students attending the university are only required to have the Measles, Mumps, and Rubella vaccine to attend classes. Therefore, clinicians and students do not have needed information for a vaccine discussion and the university health center cannot track overall vaccine adherence rates. Further work related to the MenB vaccine is indicated because these vaccine rates were significantly lower than those for Influenza and HPV. Topics to consider include data collection related to patient-specific reasons for receiving or not receiving vaccines and patient perceptions of provider approach to vaccine discussions.

Conclusions

The outcomes of this study clearly indicate that MI has the potential to improve vaccination rates as part of an overall vaccine strategy that addresses normative beliefs, control beliefs, and behavioral beliefs. Vaccine rates improved for the annual influenza vaccine with stable numbers of HPV vaccines and a decrease in MenB vaccines. Furthermore, clinicians demonstrated improvements in MI knowledge after an education session that was reinforced during a 4-month period of time and likely contributed to an increase in the number of influenza vaccines given as part of an overall immunization strategy.

Authors' contributions: *R. Wermers is the primary author of the article and worked collaboratively with T. Ostroski to design the QI initiative. She was responsible for the adaptation of the measurement tool used and was responsible for data analysis in SPSS. T. Ostroski assisted in the design and implementation of the QI study, and she served as a liaison to the University for historical data collection. T. Ostroski contributed in the editing and the writing of the article as well as an analysis of the data and review of limitations. D. Hagler assisted in the designing of the QI study and as faculty mentor is the primary investigator. She assisted in the adaptation of the measurement tool, data analysis, and in the editing of the manuscript.*

Competing interests: *The authors report no conflicts of interest.*

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