Original Research Paper

Limiting gender bias in medicine by improving student knowledge and attitudes

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Abstract

Background: There are gender disparities for women in medicine, with poorer health outcomes and decreased representation in the physician workforce. While many solutions have been proposed, the unconscious bias that perpetuates these disparities is hard to change. In this study, we examined the impact of an educational intervention focused on the history of women's rights in the United States, on students' knowledge, perceptions, and attitudes towards women's rights. The educational intervention was designed using critical theory to improve student knowledge of the social and historical contexts that have led to gender disparities, promoting critical reflection of beliefs in an attempt to modify student attitudes towards women's rights. We hypothesized that men and women would respond differently to this educational intervention, based on their prior knowledge, experiences, and beliefs. **Methods**: The knowledge and attitudes of 159 allopathic medical students were measured between 2023–2024 using a pre- and post-survey to assess the impact of participating in a modified jigsaw educational intervention on gender bias. **Results**: Students identifying as women had more formal education or experiences with women's reproductive rights compared to students identifying as men. On average, students showed improved knowledge, answering 4.94 questions correctly on the pre-survey compared to 8.65 questions on the post-survey ($p < 0.001$); however, women began with a higher knowledge level than men. Finally, student attitudes, as measured by agreement with statements, also changed post-intervention, and written statements indicated students' desire to advocate for women. **Discussion**: This study shows that a single educational intervention can impact students' short-term knowledge and attitudes toward women's rights, which is the first step towards creating agency in students to mitigate the gender biases seen in medicine.

Keywords: Gender equity, sexism**,** marginalized, women, gender gap, workforce diversity

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Background

Gender disparities have long been a part of our global human history, and the impacts can be seen at every level of society, from leadership to education and even healthcare outcomes.[1,2] In the United States, despite having fought for women's rights over the last century, with legal rights battles in the 1920s, to the women's rights movements of the 1960s and 70s, women continue to have reduced autonomy over their lives and bodies compared to men.[3] Historically, there have been many limitations to women's bodily autonomy, including forced sterilization, limited control over reproductive choices, and limited ability to participate in health research.[4] Together, these inequities have led to increased suffering for women with health conditions that, with more knowledge of female bodies, could be treated.[5] Historically, a person's sex and gender were used interchangeably, however current social norms recognize intersectionality, which separates a person's biological sex from their gender. In this study, the terms female and male are used to refer to an individual's biological sex, while the terms woman and man are used to indicate a person's gender. Both female biological sex and people who identify as women have been shown to be at increased risk for disparities.[1,2]

Significant differences in physiology, anatomy, genetics, and hormones exist between females and males that define their health, disease presentation, and medication efficacy.[6,7] The medical field has historically failed to acknowledge sex differences, utilizing the male body as the "standard" human in medical research studies.[6] Therefore, the healthcare interventions developed and delivered to patients are not reflective of these biological sex differences and result in health disparities for females.

The recent emphasis of the healthcare differences by sex and gender can be attributed to the growing number of women entering the medical and research fields; however, challenges exist that limit women's career success.[8] In the US, despite recent increases in women medical trainees reaching or just exceeding 50% in 2023, there are fewer practicing women physicians (~45% full time faculty) compared to men, similar trends are seen across the world.[9,10] Women physicians encounter more obstacles than men colleagues, including a lack of mentorship, minimal leadership positions, and limited educational opportunities.[1,11] Gender concordance between patient and provider is especially important for improving health outcomes when treating gendered conditions (gynecologic/breast cancer)[12–15]. Women frequently initiate discussions regarding gender disparity; however, due to their limited representation in leadership roles, their influence and impact on this issue often remain minimal.[7,16]

While the studies described above have documented gender bias in healthcare outcomes and the medical workforce, few studies have proposed strategies to mitigate these biases. Current medical education has minimal (if any) curricula that address gender biases and sex differences.[16–19] The implementation of microaggression training and gender education into medical education can reduce gender-biased attitudes in individuals.[20–22] Thus, we hypothesize that educating future medical providers about gender biases may reduce gender bias, and improve future interactions with colleagues and patients alike. The educational pedagogy, critical theory, supports this developmental progression. This teaching philosophy empowers students to be co-participants in the learning process to recognize and examine the institutional inequities that have led to marginalization of certain populations.[23,24] Students learn from and with each other to critically evaluate commonly accepted assumptions, identify hidden power structures and patterns of inequity, and challenge their own beliefs.[24]

In this study, second-year medical students were provided with an educational intervention grounded in critical theory to learn about pre-selected historical events dealing with women's reproductive rights. We hypothesized that student gender would impact the knowledge perceptions/attitudes, and ultimately behaviors/actions gained following this educational intervention. This comparison by gender is important, as it exposes the differences that may exist in the impact on students from education efforts to reduce gender bias. Exposing students to the existing gender differences and biases found in medicine early in their medical careers could positively influence their views, leading to an improvement in their interactions with future patients and colleagues.

Methods

This study was conducted at a Midwest allopathic medical school in the health system science course over a 2-year period (2023 to 2024); learners were second-year medical students. The University's institutional review board exempted this study (2024-1189). This study uses a mixed methods approach to evaluate quantitative changes in student knowledge and agreement with attitudinal and perception statements, as well as qualitative analysis of free-text responses provided by students. The learning activity was structured using a modified jigsaw methodology, a collaborative learning strategy where students become experts on a topic in small groups and then share their knowledge with the larger group.[25] Students individually completed the pre-survey. They then worked in small groups to research pre-defined historical events focused on women's reproductive health. Each group then presented its findings to the whole class, and a timeline of U.S. historical events that have shaped the current landscape of women's reproductive health was assembled. Following the student presentations, a whole-class discussion was facilitated by faculty with expertise in ethics and law, giving some of the topics more in-depth attention, highlighting common themes, and addressing any student questions. Following this discussion, students individually completed the post-survey.

Student knowledge, perceptions and attitudes were measured using a pre-event and post-event survey. The post-survey also included questions to evaluate the event. Pre- and post-surveys were anonymous but were linked using a student-defined code. In the pre-survey we collected student demographic

information including gender (man, woman, transgender, other), geographical state of upbringing, age, and race; as well as any prior exposure to the content. All variables were categorical to protect student anonymity. Using a 6 point-Likert scale of agreement, students were asked their level of agreement with 8 gender-related experiences statements (pre-survey), 7 knowledge-based statements (4- pre and post and 3- post only), and 7 attitudinal statements (5-pre and post, 2- post only). Six of the eight experience items (indicated by * in the Tables) were adapted from a psychometric evaluation study by Parker et al.[26] Eleven multiple choice knowledge questions were posed in the pre- and post-surveys to explore changes in student understanding of the content. The post-survey also contained an open-ended question asking students to "describe at least one aspect of the activity that was beneficial to their learning". The pre- and post-surveys were piloted by a small group of students and faculty prior to their dissemination but knowledge questions were not validated prior to use.

Quantitative data were analyzed using descriptive statistics (frequencies and percentages). The student-reported gender-stratified data, and comparisons between women and men or pre- and post-data were conducted using a Student's t-test or Mann-Whitney U test with an alpha of 0.05. To account for multiple comparisons, Bonferroni correction was used, dividing the conventional alpha level of 0.05 by the number of tests conducted, limiting the likelihood of Type I errors. Cohen's d was used to measure the effect size of each statistically significant comparison. In cases where proportions were compared, a z-test was used for comparison. Only three individuals in the cohort reported being "transgender" (n=1), or "other" (n=2), these students were included in the overall analysis but not in subgroup analysis. In subgroups with less than 10 individuals it may be possible to identify individuals based on their responses and these small subgroups are unlikely to show meaningful differences, thus were not reported in this study. For qualitative data, free-text responses were analyzed using an inductive thematic analysis. Using an iterative process, common themes were identified, refined, and each response was sorted into one or more categories. Quotes were selected that best illustrate the themes.

Results

In total, 159 students participated in the study; 57.2% were women, and 40.9% were men. Three students did not use their defined code when completing the post-survey, leaving 156 students for paired pre-post analysis. The students in these cohorts came from 25 different states across the US, with an average age of 24.8 years (21–38 range). On average, 18.5% of students were from underrepresented groups in medicine. In total, 13.2% of students previously had formal education in women's health, and of those, 8.8% were women and 4.4% were men. Students were asked if they had personal knowledge of someone (self/family/friend) who had a challenging experience with women's health; 53.4% indicated they did, with the majority of those responses coming from women (Table 1).

Table 1: Participant Demographics

Demographic Category	N (%)
Gender	
Woman	91 (57.2)
Man	65 (40.9)
Other	3 (1.9)
Formal Education in Women's Health	
Yes—Women	14 (8.8)
Yes—Men	7 (4.4)
Knowledge of a Challenging Experience in Women's Reproductive Health (Self/Family/Friend)	
Yes—Women	62 (39.0)
Yes—Men	21 (13.2)

Students completed an optional series of questions related to demographic information in the pre-survey. All students (n=159) completed the questions.

To understand if there were differences in student perceptions of women's health topics by gender, students were asked a series of questions about their lived experiences, observations, and awareness of the impacts of gender on healthcare. Overall, students agreed that medical education and medical knowledge are skewed toward favoring men. Most students agreed they have observed and encountered gender-biased attitudes and behaviors both among peers and in clinical settings. When asked if their gender impacted how faculty evaluated their performance, most students disagreed. When data were stratified by gender, the difference between women's and men's responses was statistically significant for most statements, with women more strongly agreeing than men (Table 2). Overall, the patterns seen here are an important indicator of how much gender impacts our experiences and perceptions. Taken together, this data suggests that there is a bias in student perceptions about gendered topics in medicine, with women observing these gendered biases at a much higher rate than men.

Table 2: Students´ Lived Experiences and Awareness about Gender in Healthcare

	Overall Mean (STD)	Women Mean (STD)	Men Mean (STD)	*P* Value	Cohen's D
Men are treated as the default in medical education.[a]	4.74 (1.13)	4.97 (1.05)	4.42 (1.17)	0.002[b]	0.495
Medical studies are mainly performed on men.[a]	4.92 (0.95)	5.11 (0.89)	4.65 (0.98)	0.003[b]	0.491
I believe that medicine is dominated by men.[a]	4.12 (1.26)	4.40 (1.10)	3.72 (1.36)	0.005[b]	0.550
I have observed gender-biased behaviors or attitudes in the clinical setting.[a]	4.21 (1.24)	4.48 (1.21)	3.83 (1.19)	<0.001 [b]	0.542
I have observed microaggressions in the healthcare setting towards women peers/colleagues.	4.02 (1.50)	4.41 (1.36)	3.48 (1.54)	<0.001 [b]	0.640
I have encountered gender-biased ATTITUDES among other students.[a]	4.28 (1.39)	4.66 (1.30)	3.74 (1.35)	<0.001 [b]	0.694
I have encountered gender-biased BEHAVIORS among other students.[a]	3.99 (1.35)	4.42 (1.27)	3.4 (1.25)	<0.001 [b]	0.810
My gender has impacted the way that faculty or peers have evaluated my performance during medical school.	2.92 (1.28)	2.98 (1.16)	2.83 (1.44)	0.272	0.115

Students (Overall n=159, women n=91 and men n= 65) were surveyed in the pre-assessment using a series of statements with a 6-point Likert scale rating their level of agreement with the statement (1=Strongly disagree, 2=Disagree, 3=Somewhat disagree, 4=Somewhat agree, 5=Agree, 6=Strongly agree). Data were stratified by student-identified gender. The average response for women and men to each item was compared using a Mann-Whitney U test. Abbreviations used include: standard deviation (STD). [a] Items were adapted from Parker et al.[b] Bonferroni correction was applied to limit type 1 error and a p-value of 0.00625 was used for statistical significance.

To determine if student perceptions can be impacted by increasing their knowledge, an educational intervention was designed to teach students about historical events that have impacted the current climate surrounding women's reproductive health. We hypothesized that increasing students' knowledge would affect their perceptions and attitudes, potentially influencing their behavior, and that this would occur differentially by gender. Only knowledge and attitudes were measured in this study.

Students´ knowledge about historical events related to women's reproductive health were compared pre- and post-intervention with an 11-item assessment. Overall, student knowledge improved from a score of 4.94 to 8.65 questions correct on average ($p < 0.001$). The average scores of women (5.18 to 8.94, $p < 0.001$) were slightly higher than those of men (4.61 to 8.27, $p < 0.001$), but both groups showed a statistically significant increase in knowledge. Student agreement with four pre-post

knowledge statements showed a statistically significant improvement for three statements; women started and ended with higher levels of agreement than men, but both groups showed significant improvement in knowledge. Finally, a majority of students indicated that they agree, or strongly agree, that their understanding of women's reproductive rights increased following the event (Table 3). Women were significantly more likely to agree than men that they wanted to learn more about women's reproductive justice. This same trend was also seen in responses to the open-ended question of "describe one aspect of this activity that was beneficial to your learning" free-text comments provided by students(98%, n=153/156), where a majority of students (50%, n=76 of the 153 comments) indicated increased knowledge on the various topics covered was most beneficial to them following the event. Quotes are provided below to highlight this trend.

Table 3: Student Agreement with Knowledge Statements Relating to Women's Reproductive Rights

	OVERALL (n=156)			WOMEN (n=89)			MEN (n=64)		
Pre-Post Knowledge Statements	PRE Mean (STD)	POST Mean (STD)	P Value	PRE Mean (STD)	POST Mean (STD)	P Value	PRE Mean (STD)	POST Mean (STD)	P Value
The gender of the patient impacts the quality of the care they receive	4.19 (1.44)	5.02 (1.12)	0.160	4.49 (1.25)	5.30 (0.92)	<0.001a#	3.80 (1.57)	4.67 (1.18)	0.001a#
Minority women have been historically mistreated by the medical field.	5.59 (0.74)	5.78 (0.57)	0.041	5.79 (0.44)	5.89 (0.35)	0.249	5.38 (0.81)	5.69 (0.50)	0.049
I can describe at least five historical events that have impacted on women's reproductive rights	3.64 (1.44)	5.33 (0.85)	<0.001a*	4.02 (1.28)	5.54 (0.60)	<0.001a*	3.11 (1.46)	5.11 (0.93)	<0.001a*
Forced sterilization of women has occurred in the US in the last century.	4.68 (1.19)	5.78 (0.57)	<0.001a*	4.88 (1.05)	5.87 (0.38)	<0.001a*	4.44 (1.26)	5.73 (0.48)	<0.001a*
Post Survey Evaluation of Knowledge									
This event increased my knowledge about women's rights		5.34 (0.82)			5.47 (0.71)			5.20 (0.78)	0.030
This event has piqued my interest in learning more about women's reproductive justice		4.91 (1.15)			5.17 (1.01)			4.58 (1.17)	<0.001b
This event impacted my awareness of issues regarding women's reproductive justice		5.26 (0.92)			5.42 (0.78)			5.09 (0.92)	0.025

Data from the pre-and post-survey asking students to rate agreement with a series of statements using a 6-point Likert scale rating their level of agreement with the statement (1=Strongly disagree, 2=Disagree, 3=Somewhat disagree, 4=Somewhat agree, 5=Agree, 6=Strongly agree). The mean Likert score value for each cohort was shown followed by the standard deviation in parenthesis. All analysis used a Mann-Whitney U test for comparisons. Pre- and post data were first compared to show changes in the cohort following the event (Overall n=156). Data were then stratified by student-identified gender (women n=89 and men n= 64), to compare pre-and post knowledge statements for each student in a gendered way. The post-evaluation survey responses were compared between women and men. Bonferroni correction was applied to limit type 1 error, a p-value of [a]0.0125 or [b]0.0167 were used for statistical significance. Cohen's d was used to measure effect size of each statistically significant comparison. [#]Moderate effect (>0.5), [*]Large effect (>0.8) p-values for the pre-post knowledge statements compare the pre- and post- values for each group. p-value for Post Survey Evaluation of Knowledge questions compares the results between women and men.

> *"It was beneficial to gain an overview of the historical context that has led to today's current state of women's health and reproductive rights, as well as to be aware of the current practices that are still carried and enforced across the country."—Woman*

> *"My main takeaway is that I learned to highlight the importance of our history of healthcare in our country and recognize that I was unaware of a majority of the topics we covered today."—Man*

> *"Although I was familiar with a lot of the events discussed today, I learned quite a bit about historical events that I had not previously heard of. Additionally, I learned how recent historical events are affecting medical practice today and what they technically mean in a legal scope."—Woman*

> *"This session brought to light many acts of mistreatment and improper medical management that I was not aware of previously. It made me more deeply consider reproductive rights and health compared to what I thought previously."—Man*

Student attitudes about women's reproductive justice were measured pre-and post-intervention by asking students to respond to a series of statements on the pre-post surveys and in the post-survey feedback and comments. Students' overall ratings of the attitude statements were quite high on the pre-intervention survey, resulting in minimal change in the post-survey (Table 4). Interestingly, when asked to rate agreement with the statement: "Healthcare is a right", women more strongly agreed on post-survey (pre 5.76 versus post 6.0, $p<0.001$), while men decreased their initial level of agreement with that statement (pre 5.44 versus 4.72, $p<0.001$). On the post-event survey, overall, students agreed with the statement: "this event impacted my attitude towards women's rights" with an average Likert score of 4.60 (+/- 1.33); with no statistically significant differences found between genders ($p=0.79$). Similar trends were seen for the statement: "This event encouraged me to fight against the reproductive injustices seen for women", with an overall rating of 4.92 (+/-1.17), (women 5.06 (+/-1.12), men 4.75 (+/-1.14); $p=0.1$). Finally, 15% of the free-text comments about the event suggested a desire to move beyond knowledge towards action, and included statements about their thoughts, feelings, or desires to impact the future. Examples of these statements can be found in the quotes below.

> *"I learned that the road to women's reproductive rights and justice has only recently been uncovered and that it is our responsibility to be aware, protect, and fight for our female patients and their reproductive rights."—Woman*

> *"I enjoyed seeing the historical events of reproductive justice and relevant Supreme Court rulings placed in chronological order as I can better understand where and how reproductive freedoms still need to be advocated and fought for."—Woman*

> *"I thought learning about how these decisions are made was important because it could affect us all in the future. Not only on a societal level but on a personal level, being aware of the decisions made is important in how we will all practice medicine in the future."—Man*

> *It was beneficial to "[Understand] that this struggle still extends forward, and we play an important role in fighting this issue."—Man*

> *"I learned about specific cases impacting women's rights and now feel much more capable of advocating for women's rights."—Woman*

Discussion

Overall, this study shows gender discrepancies in students' perceptions about the impact of gender on medicine. In general, women tend to agree more strongly with the observation/experience of the effects of gender in medicine than men. Despite starting with different levels of experience and knowledge of gender in medicine, all students showed significant learning following the event. Additionally, students largely agreed that the event impacted their attitudes towards women's rights. This suggests that despite starting from different places, both women and men saw improvements in knowledge and reported impacts on attitude following the event. From the students' lived experiences, we were pleased to see that students in this study did not report having observed biases in the evaluation of student performance in medical school; however, it is important to note that students

Table 4: Student Agreement with Attitude and Perception Statements

	OVERALL (n=156)			WOMEN (n=89)			MEN (n=64)		
Pre-Post Attitude Statements	PRE Mean (STD)	POST Mean (STD)	P Value	PRE Mean (STD)	POST Mean (STD)	P Value	PRE Mean (STD)	POST Mean (STD)	P Value
Patients of all genders deserve equitable care.	5.89 (0.49)	5.81 (0.70)	0.68	5.96 (0.26)	5.85 (0.65)	0.69	5.88 (0.33)	5.83 (0.49)	0.86
Women should have autonomy over their body and their reproductive decisions.	5.65 (0.77)	5.71 (0.73)	0.66	5.80 (0.61)	5.85 (0.55)	0.69	5.52 (0.73)	5.56 (0.69)	0.81
Men should have autonomy over their body and their reproductive decisions.	5.67 (0.75)	5.74 (0.70)	0.47	5.81 (0.58)	5.87 (0.53)	0.69	5.53 (0.71)	5.63 (0.65)	0.51
Further research for contraceptive options for men should be pursued.	5.38 (1.04)	5.46 (0.97)	0.56	5.63 (0.77)	5.69 (0.70)	0.75	5.11 (1.16)	5.20 (1.09)	0.68
Healthcare is a right.	5.60 (0.84)	5.47 (1.13)	0.73	5.76 (0.58)	6.0 (0)	0.038	5.44 (0.92)	4.72 (1.44)	<0.001[a] [b]

Data from the pre-and post-survey asking students to rate agreement with a series of statements using a 6-point Likert scale rating their level of agreement with the statement (1=Strongly disagree, 2=Disagree, 3=Somewhat disagree, 4=Somewhat agree, 5=Agree, 6=Strongly agree). The mean Likert score for each group was provided followed by the standard deviation in parenthesis. Data were stratified by student-identified gender, pre-and post knowledge statements were compared using a Mann-Whitney U test. [a] Bonferroni correction was applied to limit type 1 error and a p-value of 0.01 was used for statistical significance. Cohen's d was used to measure effect size of each statistically significant comparison; effect size is indicated as follows: [b]Moderate effect (>0.5)

were in their second year foundational science courses, with minimal experience in the clinical setting. Most evaluations completed thus far in our curriculum consisted of summative examinations or clinical OSCEs with faculty who had more formal training in education, which may lead to more unbiased evaluations. The literature does not support the lack of gender bias in evaluations for more subjective assessments.[27–32]

In studies comparing medical student genders (women vs men), gender bias has been repeatedly identified. Women experience lower performance evaluations, fewer procedural opportunities, and fewer positive traits are identified in recommendation letters. Most of these evaluations are subjective and, therefore, are impacted by unconscious biases.[27–30,33,34] Further, female physicians are more likely to experience a toxic work environment, by receiving greater criticism and disparaging comments and having their competence questioned by patients and colleagues compared to a lesser degree for male physicians.[30] The limited numbers of female physicians in many medical specialties make it more challenging for female trainees to find a mentor compared to males.[31] Together, this leads to diminished confidence and increased burnout rates.[11,35] Women are often excluded from leadership positions and academic promotions, even among specialties engaging in diverse recruiting practices.[35]

Our study corroborates prior research, indicating that women are more prone to witnessing and encountering gender bias in the field of medicine compared to men.[34,36] Dedicating a learning event solely to the topic of women's rights can play a constructive role in addressing gender bias in

medicine by creating a space for dialogue, a chance for both genders to explore systems of oppression, and developing solutions to the gender-related inequities seen in healthcare.

While there are specific strategies that have been implemented to try and overcome some of these limitations for women in medicine, including the use of specifically gender-neutral objective grading tools and rubrics, recommendation letter templates, faculty education about gender differences, and increasing the recruitment and representation of women in the faculty and leadership workforce, many interventions have shown limited impact, so additional solutions are still needed.[29,37–39] This study was designed to increase students' knowledge about gender disparities seen in healthcare using a critical theory pedagogy, to allow students to explore the social structures driving these problems and trigger changes in attitudes that subsequently can alter behaviors, reducing gender bias. We were able to highlight the impact that gender disparities have on health outcomes and expose students to the historical trauma experienced by marginalized groups within the healthcare system, which helps to explain patient mistrust of the healthcare system.

In this intervention we intentionally approached gender bias from the perspective of patient outcomes rather than focusing on gender bias in the medical workforce. This allowed us to use an emotional appeal technique, aimed to promote sympathy/compassion for women rather than pointing a finger at trainees to change their behavior.[40,41] Increasing the sympathy of trainees towards female patients may also lead to changes in gender bias towards colleagues in the healthcare workforce. The focus on patient outcomes was also beneficial from the study design perspective, in that it helped avoid the impacts of the Hawthorne effect on student responses.[42] If the event was designed to educate students about the gender disparities seen in the medical education and healthcare system, then student responses may have been skewed towards answers that they believed study investigators desired instead of their actual beliefs and perceptions about gender (the Hawthorne effect).[11,30,34,35]

Student knowledge and attitudes were impacted following our educational intervention for both genders. Interestingly, we saw gender bias in responses to the questions of whether healthcare is a privilege or a right, a topic that has long been debated in US culture, and which is a political topic.[43] Based on our current healthcare landscape and outcomes, it could be argued that healthcare is a privilege; but should it be? Depending on an individual's past experiences with healthcare, people often have strong personal beliefs about this issue that can even impact their own pursuit of health interventions.[44,45] As such, it was surprising to see a change in students' perception of this statement following our educational intervention. It is unclear why women more strongly supported the statement that healthcare is a right, while men disagreed more following the intervention. This may suggest that students interpreted this question in the post-survey in a different manner. We hypothesize that for women, this may be due to gender alignment with the content, leading to a firmer stance on the need for healthcare to be a right for women. In contrast, we hypothesize that men may have interpreted the event to suggest that healthcare is not always available or equitable for everyone; thus, it was viewed more as a privilege. Further studies are needed to understand this disparitiy in student responses.

This study was conducted at a single institution with two cohorts of students, which limits generalizability. Among the cohort there were only three individuals who indicated they identified as transgender or "other" which limits the conclusions which can be drawn about these populations. Additionally, whether this event has a lasting impact on students' knowledge and core beliefs still needs to be determined; it is unlikely that a single event will be sufficient to change knowledge, attitudes, or behavior in a lasting way, necessitating further incorporation of gender-specific topics into the curriculum. Efforts to support increased sex and gender topics in the curriculum are currently being pursued by numerous organizations, including the Group on Women in Medicine and Science, the American Medical Women's Association, and the Sex and Gender Health Education initiative, in addition to individual faculty.[17,46–48]

With the rapidly expanding medical knowledge that medical students need to learn and understand, it is essential that we don't lose track of the vital components of our history that impact the way that medicine is practiced. Incorporating history, justice, and hot topics into medical education provides a framework for students to better understand their patients, which improves care outcomes. Similarly, it is essential to recognize that sex and gender both impact health. Helping students to identify and

understand the differences that exist allows better outcomes for patients and providers alike.

Conclusion

Our study found a pre-existing gender bias in students' perceptions and observations about gender in medicine, upon which an educational intervention can make an impact. Increases in student knowledge about sex and gender topics in medicine, and changes in attitudes towards women's rights were observed immediately following the event. If a single educational intervention can have an immediate impact, imagine the impact of fully incorporating these topics into medical curricula. Further, teaching our students to identify oppressive structures so they can advocate for solutions to the problems they witness in medicine helps create a better future for everyone.

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