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Age and gender bias in medical students' diagnoses: a scope into gastroenterology

Abstract

Purpose: Past research suggests that older and female patients may receive inferior medical care across specialties due to subtle discrimination. The aim of the current study is to experimentally investigate this bias in the field of gastroenterology, particularly among medical trainees.

Method: U.S. medical students and residents participated in an online survey utilizing a 2 (Medical trainee gender: male, female) x2 (patient age: 27, 67) x2 (patient gender: male, female) experimental design. Medical trainees viewed a chart describing a patient with constipation and indicated how likely they were to order various treatments. Additionally, trainees evaluated patients on perceived compliance and health consciousness.

Results: 472 medical trainees from 75 institutions participated in the study. Trainees were significantly less likely to recommend the necessary treatments (comprehensive history, dietary intake information, digital rectal exam, psychological stress assessment, and routine physical exam) for older female patients than for young female patients. The digital rectal exam was recommended for a greater proportion of older male patients than young female, young male or older female patients. Additionally, male trainees were less likely to recommend necessary treatments overall as compared to female trainees. Female trainees tended to have more optimistic affective evaluations of patients, illustrating more general positivity toward patients, expecting better medical compliance from patients, and perceiving patients to be more health conscious.

Conclusion: Age and gender biases are apparent in medical trainees, particularly in the diagnosis of constipation. Initiatives in medical education should be undertaken to recognize and eliminate these subtle biases.

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Abby Corrington,[1] Chethan Ramprasad,[2] Trishna Narula,[3] Mikki Hebl[1]

[1]Department of Psychological Sciences, Rice University in Houston, USA

[2]Resident Physician in Internal Medicine, New York University School of Medicine USA

[3]Fellow in Population Health at Harris Health System in Houston, USA

Correspondence: Abby Corrington, Rice University, 6100 Main Street, MS 25, Houston, TX 77005, USA, Email abby.corrimgton@rice.edu

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Introduction

The Hippocratic Oath taken by all physicians imparts the duty to care for "all fellow human beings," applying "all measures [that] are required" to prevent and cure disease. However, even the most well-intentioned doctors may be at risk of unknowingly breaching this pledge. In fact, a growing number of studies are beginning to examine the discrimination that medical providers display toward patients from protected demographics, including in diagnoses, dosaging, and treatment of pain in post-surgical and cancer patients.[1–5]

In the United States, both older adults and women are considered members of marginal social groups, as they each have negative stereotypes associated with them. Indeed, a great deal of research in the medical field suggests that older patients[6] and women[2] may receive subpar treatment relative to younger patients and men. Regarding older adults, specifically in the context of medicine, these stereotypes include the ideas that "all old people are ill," and that "illness is a natural part of aging".[7–9] Previous research has shown that medical providers are susceptible to these stereotypes and may overemphasize the influence of aging as a contributing factor.[9] Regarding women, in the context of medicine particularly, these stereotypes include the assumption that women are more expressive and emotional than men, a belief that can lead to their symptoms not being taken as seriously as are male patients' symptoms.[2]

Some research suggests that these biases in treatment are present even at the beginning of medical training. For example, in the evaluation of patients with coronary heart disease, medical students and residents were less likely to diagnose women with symptoms such as chest pain or refer them to cardiology specialists.[10] In another study, first-year clinical residents were less likely to order laboratory tests for patients with neck pain if they were female as opposed to male.[11]

The intricacies of biased care for the elderly and women are particularly interesting in the field of gastroenterology, yet are limited in study. To our knowledge, the only existing study exploring gender bias in the diagnosis of gastrointestinal disorders found that, when evaluating patients with constipation, there were differences in diagnostic tests that were ordered by Swedish medical trainees.[12] For example, providers were more likely to test for thyroid disorders in female patients and to test for alcohol and drug use in male patients. This study was limited in power and was unable to determine an interaction between provider gender and patient gender.

Importantly, the implications of gender predispositions in functional bowel disease, such as constipation, are well-understood. Research shows that two-thirds of patients with irritable bowel syndrome (IBS) are women,[13] and while medical science has not yet explained this gender predisposition, a biased approach to evaluative care might exacerbate problems for some people. Additionally, appropriate diagnosis of constipation in a real-world clinical scenario, contrary to popular belief, is high-stakes. The potential consequences of misdiagnosed or undiagnosed constipation, particularly in an older person, include serious issues such as bowel obstruction, which in turn could involve life-threatening complications necessitating a hospitalization or surgery.[14]

Given the continuous pressure on physicians to make important decisions for patients in a limited amount of time,[15,16] shifting systems of health care (e.g., related to health insurance policy) today,[17] the quality of medical care that patients receive is a topic of utmost

importance. In this study, we examined medical trainees' responses to virtual patients complaining of constipation and explored not only how the gender of the medical trainee influenced care, but also how the gender and age of the patient influenced the care recommended.

Method

This study utilized a Qualtrics survey, which was distributed via social networking sites (Facebook and Twitter) and email listings for medical schools using a snowball recruitment technique.[18] Participants were asked to participate in a 20-minute study investigating "medical students' and residents' evaluations of patients based on various conditions and characteristics," and all who consented to participate received a $5 Amazon online gift card. The study was approved by the Institutional Review Board of Rice University on January 11, 2016, and was supported in part by the Society for the Psychological Study of Social Issues (SPSSI). After participants were presented with a description of research procedures, they provided informed consent for participation. The study utilized a 2 (medical trainee gender: male, female) x2 (patient age: 27years old, 67years old) x 2 (patient gender: male, female) between-subjects experimental design. Replicating the procedures of Hebl and Xu,[19] participants examined the medical chart of a fictional patient who was described as having generally good health with the exception of gastrointestinal problems (Figure 1 for example). Each participant was randomly assigned to one of four conditions in which they viewed the medical chart of a 27year-old male, 27year-old female, 67year-old male, or 67-old female. Medical information was held constant across conditions, with the exception of age and gender, which were fully crossed. Upon examining the medical chart, participants responded to several questionnaire measures. Upon completion of the survey, participants indicated their own gender, age, ethnicity, geographic location, and year in medical school or residency.

Height: 5'9"	**Weight:** 195 lbs	**Age:** 67	FOR LABEL USE ONLY Form # 08-19-090 09/21
Race: White	**Gender:** Female	**Marital Status:** Married	
Temp (°F): 98.7	**BP:** 137/84	**Pulse (bpm):** 77	
Allergies: None known		**Medication:** Tylenol - 500 mg/day, Vitamins	

Medical History: Hypertension, arthritis

Chemistries		Blood Count		Lipid Panel	
Na (mEq/L)	140	Hemoglobin (g/dL)	14.5	TC (mg/dL)	180
K (mEq/L)	4.2	Hematocrit (%)	42.5	LDL (mg/dL)	85
Glucose (mg/dL)	86	WBC (/mcL)	6,500	HDL (mg/dL)	60
Creatinine (mg/dL)	0.9	Platelets (/mcl)	400,000	TG (mg/dL)	140
BUN (mg/dL)	12				

Chief Complaint:
Patient is a 67-year-old female presenting with severe constipation for the past week and a half. Patient first experienced severe difficulty defecating one and one-half weeks ago. Irritability, decreased appetite, and early satiation have accompanied constipation. Was concerned about level of discomfort and potential complications. No pain at present. No family history of gastrointestinal disorders. No single event seemed to precipitate onset.

Physician Notes:
Patient had physical six months ago and was deemed to be very healthy. Social drinker. Non-smoker.

Figure 1 Example of patient medical chart viewed by medical students and residents before making treatment recommendations.

Participants indicated how likely they were to order tests (e.g., abdominal X-ray), treatments (e.g., pain medication), and referrals (e.g., mental health consultation) presented, using a 7-point Likert-type scale anchored by *Very Unlikely* (1) and *Very Likely* (7). Each test, treatment, and referral was considered to be recommended if the medical trainee responded with either a 6 ("Likely") or a 7 ("Very likely") on the 7-point Likert-type scale. The likelihood of treatment recommendations measure was found to be highly reliable (49 items; α =.93). To determine which tests, treatments, and referrals were appropriate for each age and gender combination, we consulted 24 experienced physicians of various medical subspecialties (internal medicine, obstetrics/ gynecology, family medicine, gastroenterology; average medical experience =22years). There was solid consensus in ratings of what was appropriate by these physicians, with agreement among physicians averaging 85% (and ranging from 50% to 100%). Tests, treatments, and referrals were classified as "necessary" if a majority of the physicians indicated that they would recommend it. Five tests, treatments, and/or referrals emerged as necessary for all four patient "profiles" (older female, older male, young female, young male) using this method: comprehensive history, dietary intake information, digital rectal exam, psychological stress assessment, and routine physical exam. For simplicity, these will be referred to as "treatments" throughout the remainder of the manuscript. Chi squared tests and an Analysis of Variance (ANOVA) were performed.

Participants' affective reactions to patients were assessed using 20 items adapted from Hebl & Xu.[19] The measure used a 7-point Likert-type scale anchored by *Strongly Disagree* (1) and *Strongly Agree* (7). Sample items included the extent to which they "would feel positively" about the patient, the extent to which they expected the patient to "follow advice," and the extent to which they expected the patient to be "healthy." Higher numbers indicated more positive reactions and expectations for patients. We conducted an analysis of variance (ANOVA) with medical trainee gender, patient age, and patient gender as the independent variables and likelihood of treatment recommendations as the dependent variable. We also tested a mediation model with medical trainee gender as the predictor variable, medical trainee's affective reactions as the mediator, and likelihood of treatment recommendations as the outcome variable.

Results

A total of 259 (55%) female and 213 (45%) male medical students and residents from 75 medical training programs (allopathic and osteopathic) throughout the U.S. completed our study. Participants ranged in age from 20 to 43years old (M=26years old) and were White/ Caucasian (50%), Asian/Asian American (23%), Asian Indian (8%), Hispanic/Latino (7%), and Black/African American (2%). Ten percent were of another ethnicity or preferred not to answer. The sample was reasonably representative of the nation's medical trainees.[20] A total of 48% of participants were in their first two years of medical school, 41% were third- or fourth-year medical students, 9% were medical residents, and 1% indicated another level of training (e.g., MD/PhD students in their research years).

ANOVA revealed an interaction of patient age and patient gender, $F(1, 464)=4.50$, $p=.03$, η_p^2 = .01. Tests of simple main effects revealed that medical trainees were significantly less likely to recommend the necessary treatments (comprehensive history, dietary intake information, digital rectal exam, psychological stress assessment, and routine physical exam) for older female patients (M=2.95, SD=1.36) than for young female patients (M=3.34, SD=1.09) ($F(1, 464)=4.50$, p=.03, η_p^2=.01). This patient age effect did not hold true among male patients. Figure 2 shows the mean number of necessary treatments recommended for each patient profile. Additionally, the comprehensive history was recommended for a smaller proportion of older female patients (0.47) compared to young male (0.56), older male (0.57), and young female patients (0.66), $\chi^2(3, N=472)=8.25$, $p=.04$). On the contrary, the digital

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rectal exam was recommended for a greater proportion of older male patients (0.63) than young female (0.40), young male (0.43), and older female patients (0.45), $\chi^2(1, N=472)=15.15$, $p<.01$. The psychological stress assessment was recommended for a greater proportion of young female patients (0.62) compared to older female (0.41), older male (0.42), and young male patients (.43), $\chi^2(1, N=472)=14.17$, $p<.01$.

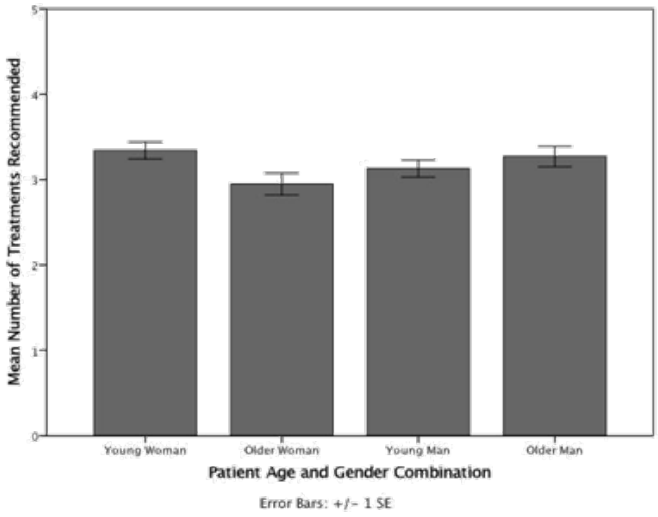

Figure 2 Bar graph showing the mean number of necessary treatments recommended for each patient profile (age and gender combination). Simple main effects revealed that the number of treatments recommended for older women was significantly lower than for younger women.

The likelihood of treatment recommendations differed significantly by medical trainee gender such that male medical trainees ($M=2.89$, $SD=1.28$) were significantly less likely to recommend the necessary treatments for patients than were female medical trainees ($M=3.41$, $SD=1.10$) ($F(1, 464)=21.41$, $p<.001$, $\eta_p^2=.04$).

Because there were no main effects of patient age or patient gender on the likelihood of treatment recommendations, a mediation model was tested using the SPSS macro PROCESS with only medical trainee gender as the independent variable, affective evaluation as the mediator, and likelihood of treatment recommendations as the dependent variable. Results for this test of simple mediation can be found in Table 1 and Figure 3, which demonstrate that the indirect effect (-0.05) was significant for medical trainee gender in predicting the likelihood of treatment recommendations [-0.12, -0.01]. Note that a confidence interval excluding zero is indicative of a significant mediation effect. Based on the directions of the (a) and (b) paths, the results suggest that, compared to male medical trainees, female medical trainees tended to have more optimistic affective evaluations: they felt more general positivity toward patients, expected better medical compliance from patients, and perceived patients to be more health-conscious, which in turn led to more thorough medical evaluations.

Moreover, although our focus was on the treatments considered necessary by the 24 advanced physicians, we were also curious regarding differences in the total number of overall treatments prescribed across groups. Therefore, we conducted exploratory analyses and found that, again, male medical trainees were significantly less likely to recommend treatments for patients ($M=12.28$, $SD=5.95$) than were female medical trainees ($M=10.58$, $SD=6.39$; $F(1, 464)=7.84$, p .01, $\eta_p^2=.02$). However, the likelihood of treatment recommendations was not significantly different between older and younger patients, or between female and male patients.

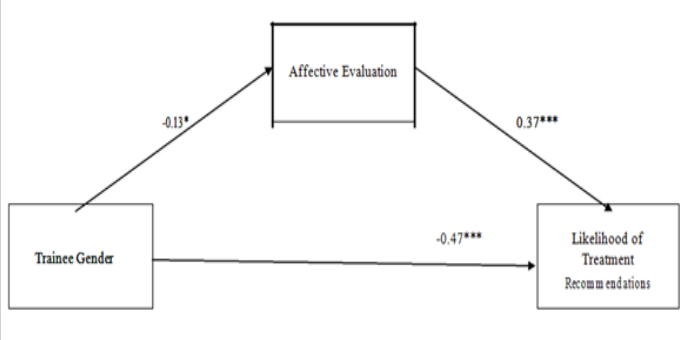

Figure 3 Path diagram illustrating the direct effect and causal path linking trainee gender and likelihood of treatment recommendations.

Note. Based on 10,000 bootstrap samples. The predictor variable of trainee gender was coded 0=female and 1=male. *p<.05. **p<.01. ***p<.001. Arrows do not imply temporal precedence of the mediator over the outcome.

More generally, the percentage of medical trainees who recommended all five of the treatments that were deemed necessary upon consultation with 24 advanced physicians (i.e., comprehensive history, dietary intake information, digital rectal exam, psychological stress assessment, routine physical exam) was 12.9%. Neither medical students' and residents' level of training (fourth-year medical student compared to first-year medical student) nor ethnicity were statistically correlated with a higher percentage of necessary treatments in the evaluation of constipation.

Table 1 Bootstrap Mediation Analyses for the Effect of Medical Trainee Gender on Likelihood of Treatment Recommendations through Affective Evaluations

BC 95% CI						
			Indirect	**SE**	**Lower**	**Upper**
Predictor	PMX	PYM	effect			
Trainee Gender	-0.13*	0.37***	-0.05	0.03	-0.12	-0.01

Note. Based on 10,000 bootstrap samples. Medical trainee gender was coded 0=female and =male. Mediator was Affective Evaluations. Dependent variable was Likelihood of Treatment Recommendations. SE, bootstrapped standard error; BC, bias corrected; CI, confidence interval; P_{MX}, path a from independent variables to mediator; P_{YM}, path b from mediator to dependent variable. *p<.05. **p<.01. ***p<.001.

Discussion

Medical students and residents in our study demonstrated age and gender biases in the evaluation of patients with symptoms of constipation. Medical trainees ordered fewer necessary treatments, most notably the comprehensive history, for older women compared to older men and younger women and men. While a potential reasoning for biased evaluations of older patients could be rationing on the basis of the belief that older patients are more expensive to treat or have a shorter life expectancy,[22] this does not explain the finding that older *female* patients received more biased care than older *male* patients. One explanation for this finding could be that older female patients are perceived to be too frail to undergo aggressive treatment, or it

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could be that older women face a cumulative disadvantage due to the intersection of two stigmatized identities – advanced age and female gender.[22]

Furthermore, male medical trainees were less likely than their female counterparts to recommend the necessary medical treatments, and perhaps most importantly, this difference in likelihood was mediated by affective evaluations. That is, results showed that male compared to female medical trainees tended to have more negative affective evaluations of patients, which led to a lower likelihood of recommending necessary medical treatments. Past research has shown not only that female physicians may be more likely to use more patient-centered communication and provide more psychosocial counseling to their patients compared to male physicians,[23,24] but also that they may be more cautious and optimistic in terms of medical care.[23] In addition, abundance of research has indicated that female medical providers may be more attentive and thorough when it comes to patient care.[25] The arenas in which this trend has been shown include patient communication,[24] medical exam performance,[26] psychosocial support,[23] provision of preventive medicine,[26] and observance of clinical standards.[27] This study adds to the literature, illustrating that female medical trainees exhibit these characteristics even early on in their training.

A possible explanation for the higher likelihood of young female (vs. male and vs. older female) patients being recommended psychological stress assessments – and the higher likelihood of older male (vs. female and vs. vs. younger male) patients being be recommended digital rectal exams – is that complaints from women and older people are taken less seriously than complaints from men and younger people.[2,28] This is only one potential rationale for our findings, and future research should attempt to identify and examine these and others further. Additionally, while we have no reason to believe that these results are specific to gastrointestinal issues, future research should explore these questions in other specialties to determine their generalizability.

The current research is important for a number of reasons. First, it elucidates that medical professionals demonstrate biases at the beginning of their medical training and prior to their formal medical careers, challenging the belief that professional medical providers exhibit biases only after years of clinical work. Second, it joins other research[25,27] and extends Eagly's social role theory[29] in showing that gender differences exist in both affective and medical evaluations provided by medical trainees. Third, it builds upon Goffman's (1963) work on stigma and other research on ageism and sexism in medicine,[8,30,31] demonstrating that patients are evaluated – both affectively and medically – differently on the basis of age and gender, despite what is certainly medical trainees' best attempt to provide equitable treatment to all. Fourth, it reveals that age and gender biases, as well as gender differences in treatment provided by medical trainees, exist within the medical specialty of gastroenterology, which has specific complexities associated with it (e.g., gender predispositions in functional bowel disease, critical consequences of misdiagnoses;1[3]; [14]). Finally, it brings to light a dire need that should – and can – be addressed by medical institutions.[32] That is, by gauging their attitudes and recommendations, medical institutions can identify biases in students and residents before they become full-fledged physicians and inadvertently allow their biases to directly affect the lives of their patients. Medical institutions can attempt to correct any biases that exist through a variety of methods, including requiring formal bias training during orientation, offering electives on diversity in medicine, and reducing the time-pressures physicians currently face.

In sum, the current study highlights the importance of examining characteristics of both patients and future medical providers to ensure equal medical treatment for all, and we hope the current study draws attention to biases that medical students and residents exhibit toward patients with gastroenterology complaints. We propose that perhaps further action concerning these biases may be needed to help future medical providers in their noble pursuit to adhere to the highest standard of their duty under the Hippocratic Oath.

Conclusion

Medical students and residents in our study demonstrated age and gender biases, particularly in the evaluation of older female patients with symptoms of constipation. Furthermore, female medical trainees exhibited more thorough medical evaluations compared to their male counterparts, an effect that is mediated by affective evaluations of patients. Biases are prevalent in medical school and may persist throughout professional careers; therefore, it is critical that medical education focus on identifying and improving these biases to graduate more equitable doctors.

Notes

We also ran a Poisson regression to predict the number of necessary treatments prescribed based on participant gender, patient gender, and patient age. The results were the same as those produced by the ANOVA and described here.

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Ethical approval

The current study was approved by the Institutional Review Board of Rice University on January 11, 2016.

Previous presentations

The current study was accepted as an abstract by the American College of Gastroenterology for presentation as a poster at the 2016 Annual Scientific Meeting and Postgraduate Course. This also means that the abstract was published in a special supplement to the October 2016 issue of *The American Journal of Gastroenterology*.

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