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What is This?
Gendered Uncertainty and Variation in Physicians’ Decisions for Coronary Heart Disease: The Double-Edged Sword of “Atypical Symptoms”

Lisa C. Welch¹, Karen E. Lutfey¹, Eric Gerstenberger¹, and Matthew Grace¹

Abstract
Nonmedical factors and diagnostic certainty contribute to variation in clinical decision making, but the process by which this occurs remains unclear. We examine how physicians’ interpretations of patient sex-gender affect diagnostic certainty and, in turn, decision making for coronary heart disease. Data are from a factorial experiment of 256 physicians who viewed 1 of 16 video vignettes with different patient-actors presenting the same symptoms of coronary heart disease. Physician participants completed a structured interview and provided a narrative about their decision-making processes. Quantitative analysis showed that diagnostic uncertainty reduces the likelihood that physicians will order tests and medications appropriate for an urgent cardiac condition in particular. Qualitative analysis revealed that a subset of physicians applied knowledge that women have “atypical symptoms” as a generalization, which engendered uncertainty for some. Findings are discussed in relation to social-psychological processes that underlie clinical decision making and the social framing of medical knowledge.

Keywords
disparities, gender, mixed methods, narrative analysis, physician decision making

Health care disparities result from a complex intersection of individual and systemic factors, one of which is variation in physicians’ decision making (Fincher et al. 2004; McKinlay 1996; Smedley, Stith, and Nelson 2003). Substantial research shows that physicians’ decisions vary by patient and physician characteristics, organizational setting, and features of health care systems (Adams et al. 2008; LaVeist et al. 2003; McKinlay et al. 2007; Shackleton et al. 2009; van Ryn and Fu 2003; von dem Knesebeck et al. 2008) as well as level of diagnostic uncertainty (Balsa et al. 2003; Lutfey et al. 2009a). Yet the processes by which these nonmedical factors intersect with uncertainty and influence physicians’ decisions remain poorly understood. In this study, we examine how physician interpretation of patient sex-gender—that is, the “entanglement” (Springer, Mager Stellman, and Jordan-Young 2011) of biological sex with social patterns of gender—influences diagnostic certainty and, in turn, creates variation in treatment decisions for coronary heart disease (CHD).

Disparities in cardiac treatments between men and women have been reduced but not eliminated. Recent research shows that women are less likely

¹New England Research Institutes, Watertown, MA, USA

Corresponding Author:
Lisa C. Welch, New England Research Institutes, 9 Galen Street, Watertown, MA 02472, USA
E-mail: lwelch@neriscience.com
than men to receive a range of CHD medications and procedures (Bell and Nappi 2000; Correa-de-Araujo et al. 2006; Galvao et al. 2006; Gold and Krumholz 2006; Shaw et al. 2008). Women fare worse than men on quality indicators for care of cardiovascular disease, despite similar insurance coverage (Bird et al. 2007; Chou et al. 2007). Sex-gender disparities are most pronounced for younger women, although slight differences persist for older women as well (Gan et al. 2000; Gold and Krumholz 2006). We focus on clinical decision making as a potential contributor to remaining sex-gender differences in CHD care.

BACKGROUND

Sex-Gender Differences in Social Context

Since the 1980s, medical researchers have made a concerted effort to incorporate women’s experiences into the medical knowledge base by examining biological differences (Epstein 2007). The 2001 Institute of Medicine report Exploring the Biological Contributions to Human Health: Does Sex Matter? concludes that sex-based differences in genetics and physiology extend beyond the reproductive system and calls for a systematic study of biological differences (Wizemann and Pardue 2001). Subsequent research has investigated female-specific health patterns, including for cardiovascular disease (Epstein 2007; Mieres et al. 2011; Mosca et al. 2004).

Early medical knowledge of CHD symptomatology resulted primarily from studies with men (Springer et al. 2011). As an example of a portrayal of typical symptoms, a current widely used atlas of cardiology (Runge and Ohman 2004) illustrates the manifestation of angina with a picture of a gray-haired white man clutching his chest while leaving a restaurant. The effort to incorporate women in the knowledge base yielded the belief that women more often than men have “atypical symptoms” (Charney 2002; Lefler and Bondy 2004; McSweeney, Lefler, and Crowder 2005; O’Keeffe-McCarthy 2008; Patel, Rosengren, and Ekman 2004), which contributes to the context in which a physician interprets symptoms and makes clinical decisions.

Medical knowledge about sex-gender differences in CHD and health generally joins a broad array of beliefs, roles, expectations, and norms (i.e., gender) that are “entangled” (Springer et al. 2011) with biological characteristics (i.e., sex). Sex-gender is pervasive in social interactions and provides a significant source of information about what to expect from others. As such, it is not surprising that sex-gender influences communication between patients and providers (DiMatteo, Murray, and Williams 2009; Mast 2007; Street 2002) and clinical decisions (Di Caccavo and Reid 1998). For example, an experiment that held constant patient communication and symptom presentation showed that physicians’ diagnostic and management decisions for the same CHD symptoms differed by patient sex-gender (Adams et al. 2008; Arber et al. 2006).

Role of Diagnostic Certainty

Uncertainty is a common feature of clinical decision making (Beresford 1991) and an important factor for understanding disparities that arise from the clinical encounter (Smedley et al. 2003). For the case of CHD, previous research has identified a relationship between patient sex-gender, diagnostic certainty, and treatment decisions. Physicians are less certain about CHD diagnoses for women than for men (Bonte et al. 2008; Lutfey et al. 2010; Lutfey and McKinlay 2009; Maserejian, Lutfey, and McKinlay 2009b), and this lower certainty is more common for middle-aged than older women patients (Arber et al. 2006; Lutfey et al. 2009a; Maserejian et al. 2009a). Moreover, physicians with lower levels of diagnostic certainty are less likely to prescribe a CHD medication or test (Lutfey et al. 2009a, 2009b).

These results suggest a pathway: A physician’s view of patient sex-gender affects diagnostic certainty (Figure 1, boxes A and C), which in turn affects the management of CHD (Figure 1, boxes C and D). Our first aim is to further specify the way in which certainty affects management of CHD by (1) distinguishing CHD tests and medications appropriate for more and less urgent cardiac situations and (2) testing whether the effect of certainty differs for men and women patients.

Mechanisms by Which Sex-Gender Can Influence Physicians’ Decisions

Our second aim is to identify a mechanism by which physicians’ interpretations of patient sex-gender influence diagnostic certainty for CHD (Figure 1, box B). Research has identified three mechanisms by which a patient characteristic might enter into clinical decision making: statistical discrimination, stereotyping, and prejudice.
In a clinical setting, statistical discrimination refers to the application of rules of conditional probability to determine a diagnosis. Under conditions of uncertainty, probabilistic decision making is a rational strategy (Balsa, McGuire, and Meredith 2005; Smedley et al. 2003). The Bayesian model of clinical decision making calls for physicians to determine the probability that a patient has a condition by weighing (1) the probability that a symptom will be observed given that the condition is present, (2) prior knowledge about the probability of the condition being present in the population, and (3) the probability that the symptom is observed in an individual patient.

Statistical discrimination can lead to disparities in clinical decision making in two ways (Balsa and McGuire 2001; Balsa et al. 2005; Ketcham et al. 2009; Maserejian et al. 2009b; Smedley et al. 2003). The prevalence hypothesis suggests that, lacking a clear diagnosis with high certainty, a physician may rely more heavily on prior knowledge about the probability of the condition being present in the population or group. This may lead to a poor match between patient needs and care provided because of underweighting of patient-specific information, incorrect recall of population-based prevalence rates, or the use of inaccurate prevalence rates (Luffey et al. 2010; McKinlay 1996). The miscommunication hypothesis suggests that a physician may have trouble understanding a patient’s symptoms because of communication barriers and might therefore rely more heavily on population-based prevalence rates with the same potential of a poor match between needs and treatments.

For CHD, a video vignette experiment has addressed the prevalence and miscommunication hypotheses (Maserejian et al. 2009b). The experimental design held constant patient presentation of symptoms (including verbal and nonverbal signals), thereby controlling for the miscommunication hypothesis; yet, differences in CHD certainty and treatments by patient sex-gender remained. A statistical test showed that respondents were not relying on population-based rates of CHD prevalence among men and women to determine diagnostic certainty, bringing evidence against the prevalence hypothesis.

A second potential mechanism is stereotyping, or the application of generalizations on the basis of group membership. Stereotyping arises from the widespread practice of social categorization (Smedley et al. 2003) and is a “highly adaptive cognitive strategy” (van Ryn and Fu 2003) for quickly making sense of information, particularly when individualized information is lacking or under conditions of fatigue, anxiety, or time constraints (Burgess et al. 2006; Muroff et al. 2007).

A third potential mechanism is prejudice, or a negative, unfounded bias based on social group membership (Dovidio et al. 1996). Although the Institute of Medicine report Unequal Treatment: Confronting Racial and Ethnic Disparities (Smedley et al. 2003) did not find substantial evidence of physicians exhibiting overt prejudice, the authors acknowledged that prejudice can be implicit and subtle (Balsa et al. 2005), making it difficult to observe and measure. Although we know of no evidence that prejudice contributes to sex-gender disparities in CHD treatments.
disparities in CHD treatments, it remains a potential mechanism.

Stereotyping and prejudice may occur purposefully or operate in the background of cognitive processing. For CHD, a previous analysis of the data set we use revealed that physicians consciously consider heart disease for both women and men but are more likely to discount a cardiac diagnosis for women (Lutfey et al. 2010). We extend the effort to understand why physicians are less certain of a CHD diagnosis for women by further examining the mechanism by which physicians’ interpretations of patient sex-gender affect diagnostic certainty.

DATA AND METHODS

To address the two aims of the study, we used a mixed-method vignette-based experimental design. We conducted statistical analyses to further specify the way that certainty affects management of CHD. On the basis of these and previously reported statistical results from our data set, we used qualitative methods to investigate in an open-ended manner how physicians incorporate patient sex-gender (via prevalence rates, stereotypes, and/or prejudice) into their determinations of diagnostic certainty.

Research Design and Data

Data are from a video vignette factorial experiment that isolated the effects of seven design factors on physician management of CHD: four patient characteristics (age, sex-gender, race, and socioeconomic status), two physician attributes (sex-gender and years of clinical experience), and cognitive priming. Because of the balanced experimental design, the effects of the design factors are independent, thereby circumventing the common problem of confounding. The video vignettes hold constant symptom presentation and communication style. Detailed descriptions of the study have been reported previously (Lutfey et al. 2010; Lutfey and McKinlay 2009).

In brief, 16 video vignettes represented all combinations (2^4) of patient age (55 or 75 years), sex-gender, race (black or white), and socioeconomic status (higher or lower). In each vignette, patient-actors presented with the same CHD signs and symptoms: chest pain that worsens with exercise and is relieved with rest, pain between the shoulder blades, elevated blood pressure, and stress. Because patients do not typically present as textbook cases, the vignette included symptoms that could suggest a gastrointestinal diagnosis and mood-related symptoms. The professional actors in each vignette were rehearsed to use the same words and gestures.

Primary care physicians were recruited to evenly fill four cells stratified by sex-gender and more or less clinical experience (≥22 or ≤12 years). We completed 256 interviews (16 vignettes × 4 physician cells × 2 priming conditions × 2 replications) in 2006 and 2007. Two interviewers conducted all interviews in person and were present throughout study activities. Interviewer training included medical vocabulary, pilot interviews, and quality control sessions.

After viewing a vignette, each participant identified diagnoses being considered, assigned a certainty for each diagnosis on a scale of 0 to 100, and formulated a management plan (including tests and medications). This information was coded and analyzed quantitatively.

Physicians then participated in an open-ended “think aloud” interview during which they were asked to explain how they developed their differential diagnoses and treatment plan as well as how this related to diagnostic certainty. Interviewers did not ask respondents to comment on sex-gender, rendering any sex-gender–related information respondent initiated. The think-aloud narratives were audiotaped and transcribed verbatim.

The study was approved by the Institutional Review Board of New England Research Institutes, and all participants signed an informed consent form. Each participant received an honorarium ($200).

Analytic Strategy

Quantitative analyses used the full sample (n = 256). We used multivariate logistic modeling to predict the likelihood of physicians’ ordering a CHD test or medication when all design variables were included without physician certainty (model 1) and then with all design variables plus physician
certainty (model 2). An interaction term for patient sex-gender and CHD certainty was also included initially; because the effect was not significant, the interaction term was not retained in the final model.2 Odds ratios were calculated for a 10-point change in CHD certainty on a scale of 0 to 100. The dependent variable, CHD-appropriate tests and medications, was grouped according to whether the tests and medications were appropriate for situations in which a physician had a sense of urgency about a cardiac condition. On the basis of the input of a clinical consultant, urgent tests included cardiac enzymes, cardiac stress testing, echocardiography, and electrocardiography; nonurgent tests included cardiac risk profile, fasting lipid profile, and tests coded as “other.” Urgent medications included aspirin or other antiplatelet agents, β-blockers, and nitrates or vasodilators; nonurgent medications were calcium channel blockers, diuretics, lipid-lowering agents, and medications coded as “other.” A third group, “tests only,” represented decisions to order CHD tests but no medications.

Given the balanced experimental design, the effects of design factors (patient characteristics, physician attributes, and priming status) are orthogonal and independent in models that do not include physician certainty. As expected, no significant differences were observed between unadjusted and adjusted models that did not include physician certainty. In the models that include physician certainty, we fit both the unadjusted and adjusted models, and none of the estimates changed substantially. As a result, we present only the adjusted models for clarity.

We do not present results for design variables other than patient sex-gender because the effects of all design variables are reported elsewhere (Lutfey et al. 2010) and this analysis is limited to explaining how physicians’ interpretations of patient sex-gender influence clinical decision making in relation to diagnostic certainty.

Qualitative analysis of the think-aloud narratives used one full replication (n = 128) to maintain balance across the seven experimental design factors. Because the qualitative data were in the form of physician narratives, we coded each transcript as a “diagnostic story” using narrative analysis (Kohler Riessman 2008). As such, coding identified the important elements raised in the story, the order the elements were raised, and how story elements affected reported actions.

Open codes included type of introduction; the order in which possible diagnoses were raised; factors affecting decisions; decision-making processes indicated through the narrative; any influence of available resources on decision making; treatment approach; any sense of urgency, uncertainty, and/or anxiety; social support or spousal influence; mention of disease rates; biological descriptors; and reference to atypical symptom presentations (including descriptions of symptoms being “atypical,” “vague,” or “nonspecific,” as respondents often used these terms together). Within each of these categories, detailed codes were developed to reflect differences in the way physicians worked through the diagnosis and decided on treatment.

Respondent descriptions of relying more heavily on population-based prevalence rates of CHD among men and women than on patient-specific information or of using inaccurate prevalence rates would provide evidence for statistical discrimination via the prevalence hypothesis. The use of video vignettes controlled for the miscommunication hypothesis by ensuring that the language and gestures of all patient-actors were the same. Descriptions of applying generalized knowledge of women or men as a group to interpret an individual patient’s symptoms would provide evidence for the use of a stereotype, and descriptions of negative, unfounded bias against men or women would indicate prejudice.

Two coders were used to interpret physicians’ references to the origin of mood-related symptoms and the role of the vignette patient’s spouse as respondents often addressed these topics in a less straightforward manner; coding discrepancies were resolved through discussion until consensus was reached. Other coding was completed by a single coder to ensure consistency, and the first two authors met regularly to discuss coding and analysis.

Analysis examined differences in physicians’ narratives for women and men patients and how themes varied according to age within sex-gender groups. Analysis began by noting differences in the frequency of codes between sex-gender groups by age to identify categories of interest. Detailed
analysis of the quotations within these categories yielded emergent themes across transcripts in each group.

RESULTS

Diagnostic Certainty Affects Physician Ordering of “Urgent” Cardiac Treatments

Multivariate logistic modeling to examine the effect of patient sex-gender on physician ordering of CHD medications and tests appropriate for urgent and nonurgent cardiac situations followed two steps (Table 1). Model 1 included patient sex-gender and the other design variables without physician certainty; in this model, physicians appeared to be less likely to order an urgent medication (odds ratio = .57, \( p = .035 \)) or urgent test (odds ratio = .21, \( p = .059 \)) for women than men. Yet when certainty was added (model 2), the odds ratio coefficients for an effect of patient sex-gender on these outcomes moved closer to one (i.e., became less important) and were no longer statistically significant.

These results show that the apparent direct effect of patient sex-gender on physician management of CHD disappeared, and physician certainty became the driver for predicting the likelihood that physicians would order CHD-appropriate tests and medications. Specifically, a 10-point increase in certainty led to an approximate 41 percent increase in the likelihood of ordering an urgent medication, a 57 percent increase in the likelihood of ordering an urgent test, and a 21 percent decrease in the likelihood of ordering a test without a medication. Inverting the odds ratios, lower physician certainty decreased the likelihood of ordering CHD medications and tests appropriate for a situation perceived as urgent and increased the likelihood of ordering a test without an accompanying medication.
In addition, the lack of a significant interaction between patient sex-gender and physician certainty showed that the effect of an established level of certainty on ordering CHD tests and medications (Figure 1, boxes C and D) did not differ for women and men patients. Taken together with previously published quantitative results from this same data set showing that a physician’s interpretation of patient sex-gender reduced diagnostic certainty (Lutfey et al. 2010; Lutfey and McKinlay 2009; Maserejian et al. 2009b), the cumulative evidence from our data set provides empirical grounding for the qualitative analysis to focus on how physicians’ views of sex-gender intersect with diagnostic certainty rather than directly influencing ordering.

Qualitative findings reveal that physicians were concerned about women with cardiac disease, but the belief that women have “atypical symptoms” was a double-edged sword for certainty.

**Physicians Are as Concerned about Cardiac Disease for Women as for Men**

In their qualitative narratives, physicians spoke of a similar, if not slightly higher, level of concern about CHD for women as for men. This concern was communicated both in the order of possible diagnoses raised and in descriptions of decision-making processes. Physicians raised a cardiac-related condition within the first three possible diagnoses for 95 percent of men patients (61 of 64) and 100 percent of women patients. In addition, about half of respondents described their decision-making process as attempting to “rule out” the most life threatening possibility, and this was most common for middle-aged women patients (60 percent) and least common for elderly men (47 percent). Similarly, physicians who spoke of focusing on cardiac disease first because of the high risk for that diagnosis more often were diagnosing women than men (55 percent vs. 38 percent, respectively), and this view was most common among physicians interpreting symptoms presented by middle-aged women (63 percent).

A physician diagnosing a middle-aged woman provided a typical explanation of the level of concern:

I have to consider coronary artery disease, and of course that’s the most important of all of these diagnoses, so that goes to the top of my list. So, she can die of coronary artery, but these other things, she’s not going to die of probably. So, my first goal is to diagnose or not diagnose coronary artery disease. (Man physician, more experience)

Given that physicians voiced this concern slightly more often for women than for men, why is it that women were less likely than men to receive CHD treatments appropriate for urgent cardiac situations?

**Physicians View Male Sex as a “Risk Factor” but at Times Interpret Women’s Symptoms as “Atypical”**

A similar number of respondents diagnosing both men and women included sex and/or gender in their narratives (47 percent and 53 percent, respectively); however, the meaning that physicians attached to sex-gender differed for men and women patients.

For men, physicians commonly mentioned sex-gender and age as significant CHD risk factors. For example, a physician who viewed the vignette of an elderly man said the following factors influenced her certainty level: “Age, sex . . . also the fact that he doesn’t call this a pain but a discomfort; however, it’s worrying him” (Woman physician, more experience). For middle-aged men, physicians typically took note of age and sex-gender and looked for additional risk factors to strengthen the case for CHD. A physician diagnosing a middle-aged man offered a typical explanation:

The first thing I did was assess his risk factors for cardiac disease when he was describing indigestion. . . . He’s a 55-year-old male which makes him already with one risk factor. When the doctor also mentioned that he was hypertensive, that gave me a second risk factor. When he gave the history that his wife says he hasn’t been taking care of himself and he hasn’t a [regular] doctor, that gave me an unknown lipid status. So, he had multiple cardiac risk factors from the beginning. (Woman physician, less experience)

Two ways in which physicians structured their diagnostic stories demonstrated the importance they gave to sex-gender as a risk factor for men. First, compared with those diagnosing women, respondents diagnosing men, especially elderly men, more often began their diagnostic narratives by listing patient characteristics, particularly sex-gender and
age. Typical of introductions of this type was the following: “A 75-year-old male with a new onset of worrisome discomfort in his chest—certainly, risk factors for ischemic disease include his age, male gender, [and] elevated blood pressure” (Man physician, less experience).

Second, among the decision-making processes described by physicians, interpreting symptoms in the context of risk factors was used most often for elderly men and least often for middle-aged women (41 percent vs. 22 percent, respectively). Typical descriptions of the decision-making process for a man patient were as follows:

I think epidemiology when I think about heart disease. . . . If you have a 75-year-old male that’s hypertensive and he has anything happening . . . below his chin . . . for him to have a cardiac event in the next ten years is pretty high. (Man physician, more experience)

This is a 70-year-old man, so his age is that he’s at cardiac risk factor already. That he’s obese . . . is another set up for coronary artery disease. Doesn’t seem that he was a man who had a healthy lifestyle. And symptoms are pretty typical—triggered by a large meal and stress. (Woman physician, more experience)

For women patients, an elderly age was often raised as a risk factor for CHD, but some physicians’ views of a woman’s sex-gender led to interpreting the symptoms presented as “atypical.” For example, a physician who viewed an elderly woman said, “Well, based on her age—that always puts her at higher risk for cardiac disease. And, I know that sometimes women will just have stomach sensations instead of chest pressure” (Man physician, less experience). Similarly, another physician said, “Well, her age. A woman at age 70—they could present atypically so the fact that her symptoms aren’t a typical angina, it doesn’t mean it isn’t” (Man physician, more experience). Physicians spoke of age as a decision-making factor as often for elderly women as for middle-aged men (56 percent and 53 percent, respectively), making sex-gender the factor that introduced a different interpretation of symptoms.

For middle-aged women patients, sex-gender took on even more salience for physicians’ interpretations. Age was viewed inconsistently, as physicians associated it both with a higher likelihood of cardiac disease (at times because of menopausal status) and with a lower likelihood. Yet physicians’ interpretation of symptoms as “atypical,” “nonspecific,” or “vague” was even more common when a woman was middle-aged. Of the 30 physicians who described atypical symptoms or presentations, 25 were interpreting the symptoms of women, and 17 of those were diagnosing middle-aged women. For example, a woman physician with more experience described the “precipitating factors and the actual global presentation” of a middle-aged woman as “an atypical presentation but consistent with female ischemic coronary disease.” Similarly, another physician said,

Well, she was having, her location of pain was kind of vague between upper abdomen and lower chest, and her symptoms were very vague, so that made me suspicious for heart diseases, especially because she’s a woman and they don’t get always the typical heart symptoms. (Woman physician, less experience)

In contrast, among physicians who used the word “typical” or “classic” to describe the patient’s symptoms in relation to cardiac disease, seven of eight were referring to men.

In short, physicians interpreted the same symptom presentation differently for men and women. As part of the experimental design, both men and women actor-patients followed the same script and were rehearsed to use the same gestures; however, for a subset of physicians, the same words and gestures carried a different meaning when presented by a woman.

This subset of physicians invoked group-based knowledge that women are more likely to have atypical symptoms for cardiac disease and applied that knowledge as a generalization (i.e., as a stereotype). For example, a physician explained her diagnostic process for an elderly woman in this way:

A lot of women are very nonspecific and vague, which is the difference of why you have to pay attention to their details as opposed to men because cardiovascular risk is the biggest cause of death in women and is usually with vague symptoms that they complain about. So, once she stated that it was different from her usual reflux that made me think, “Number one, okay, well what about cardiac?” . . . With her [pain] going to her back, sometimes women will have pain that goes to their back. (Woman physician, less experience)
The physician began with a general statement about women’s presentation of cardiac symptoms and used that as a backdrop for interpreting the specific symptoms of the patient at hand.

Other physicians began with the specific patient’s history, and the general statement about women’s presentation was used to make sense of the patient’s symptoms. As a physician diagnosing a middle-aged woman said,

My main concern with this patient was for coronary artery disease. She did have a history of what appeared to be heartburn, but now it’s having an unusual character. And, based on the fact that she’s been having mood swings . . . she’s probably menopausal, this could be a presentation of coronary artery disease which is probably slightly atypical but typical for a postmenopausal or perimenopausal female. (Woman physician, less experience)

Similarly, another physician explained, “She’s a black female with not absolutely typical chest pain, but women don’t have typical chest pain” (Woman physician, more experience).

As these excerpts illustrate, applying knowledge that women experience atypical symptoms in a generalized way was used as context for diagnosing a particular patient, especially a middle-aged woman. Even though the experimental design held constant patient presentation, about two of every five physicians viewing women patients (25 of 64) invoked the notion of atypical symptoms, and this shaped how they interpreted the symptoms presented.

The Double-Edged Sword of “Atypical Symptoms”

Using knowledge of atypical symptoms as a generalization to aid in diagnosing women proved to be a double-edged sword. For some physicians, interpreting women’s symptoms in the context of “atypical symptoms” served as a catalyst to look for cardiac disease. A physician diagnosing a middle-aged woman provided an explanation common for this group:

In a woman, unfortunately, one of the problems you get, too, with women are they are more likely to have somewhat complex or symptom complexes that are not, that can be somewhat tricky. And, I don’t want to miss this. So, that would be crucial that we looked at that in a pretty aggressive fashion. (Man physician, more experience)

For others, the generalized belief that women’s CHD symptoms are atypical engendered sufficient uncertainty to justify including other possibilities in their treatment strategies or even moving away from cardiac disease. For example, a physician diagnosing a middle-aged woman said that he “was thinking cardiac initially given her age and that she’s female she could have atypical chest pain” but later broadened his treatment plan. He explained,

Because I think in the vignette she was very vague about some things and she was equivocal on a lot of direct questions, [and] that kind of broadens my net as opposed to narrowing my scope of what I’m looking for. (Man physician, less experience)

Similarly, another physician began the diagnostic narrative with CHD being the “highest priority” because of chest pain with apparent shortness of breath and relieved by rest; however, this same physician ended his narrative by saying, “Well, as I was saying, atypical chest pain—that means possibly not cardiac, and so GERD [gastroesophageal reflux disease] would fall under that” (Man physician, less experience). Although symptom presentation was the same across vignettes, physicians decided to attend to cardiac issues as the first or only treatment strategy less often for middle-aged women than other patients (13 percent vs. 25 percent for middle-aged men, 31 percent for elderly men, 32 percent for elderly women).

Even for elderly women, the diagnostic clarity afforded by an older age did not always overcome the uncertainty that accompanied an interpretation of symptoms as atypical. For example, a physician who viewed an elderly woman explained that the cardiac diagnosis was the most serious but that several other potential diagnoses required attention as well:

So, risk factors for her would be her age, postmenopausal female, high blood pressure. . . . So, I would be going with atypical chest pain wanting to rule out the more serious . . . diagnosis first— ischemic heart disease—but also ruling out worsening reflux disease, possibility of gallbladder disease . . . other electrolyte abnormalities, or
even thyroid disease as well as anxiety or depression symptoms, which seem to be concomitant at this time. (Women physician, less experience)

In this way, symptoms that were interpreted as atypical appeared both to put CHD “on the list” and to require that a range of alternate diagnoses be pursued simultaneously.

Interpreting symptoms as atypical also led a subset of physicians away from cardiac treatments. For example, a physician viewing an elderly woman said,

Initially, I was thinking about coronary disease because of the importance of missing that diagnosis, even though the symptoms were a little vague. . . . So, with the referred pain to the back, I felt that was much less important now, that being coronary disease, so then I would pursue the gallbladder disease evaluation from that point but in a fairly urgent manner such as to get confirmatory tests that day or the next day, that being a gallbladder ultrasound. (Man physician, more experience)

Interpreting symptoms as vague presented a difficult decision about how to proceed with testing, and the physician’s perceived need to confirm or rule out a gastrointestinal diagnosis within 24 hours suggested that he remained uncertain about whether to pursue the cardiac or gastrointestinal diagnosis.

The gap between considering cardiac disease and deciding to pursue other diagnoses appeared to be related to the effect that interpreting symptoms as atypical had on a physician’s level of certainty. Among physicians who addressed how their treatment plans were related to their diagnostic certainty, those diagnosing women more often described their strategies as “exploratory” compared with those viewing men (47 percent vs. 39 percent, respectively) and less often spoke of “confirming” a diagnosis for which they were certain (16 percent vs. 45 percent, respectively). A physician viewing a middle-aged woman illustrated the connection in this way: “I think at this point it’s more exploratory just the fact that, as I said, females tend to have more of an atypical presentation for angina and underlying coronary artery disease” (Man physician, less experience).

Another physician diagnosing a middle-aged woman described a “high suspicion” of cardiac disease but also a high level of uncertainty:

Well, number one, I don’t have a final conclusion by any means or stretch [of the] imagination. The beginning of her anamnesis is she indicated . . . chest symptoms, which were rather nonspecific but very important, and therefore she is a high suspicion of having some cardiac condition. . . . In this case, we are dealing with a totally incomplete clinical evaluation . . . without having really any evidence to support anything at all. (Man physician, more experience)

For this physician, interpreting symptoms as nonspecific coupled with a lack of test results meant that “all treatment is . . . of little importance until we reach more secure diagnosis.” Conclusions such as these stood in contrast to the narratives of risk factors leading to cardiac tests and treatments that were typical of physicians viewing men patients.3

**DISCUSSION**

In this analysis, we used mixed methods to further specify a pathway suggested by prior research: Physicians’ views of patient sex-gender shape their interpretations of symptoms and affect diagnostic certainty, which in turn affects their management of CHD. The quantitative results extend knowledge about how certainty affects CHD management by showing that lower diagnostic certainty reduces the likelihood of a physician ordering CHD medications and tests appropriate for urgent situations while increasing the likelihood of ordering a test without an accompanying medication. Physicians were not ignoring the possibility of CHD for female patients; rather, those with lower diagnostic certainty were more conservative in their treatment approaches. This opens the possibility for delayed care or poorer outcomes for women who present with the same CHD symptoms as men.

Qualitative analysis revealed that applying knowledge that women have atypical symptoms as a generalization was a mechanism by which a physician’s interpretation of patient sex-gender influences diagnostic certainty. Physicians who invoked knowledge of atypical symptoms did not speak of giving more weight to population-based prevalence rates of CHD among men and women than to patient-specific information or of using inaccurate prevalence rates. This negative finding supported
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previous quantitative results that statistical discrimination via the prevalence hypothesis was not a mechanism behind the persistent sex-gender disparity in CHD treatments (Maserejian et al. 2009b). Physician narratives also did not provide evidence of prejudice against women patients; in fact, physicians voiced concern about CHD slightly more often for women than for men.

Instead, physicians who invoked the notion of atypical symptoms spoke in general terms about “atypical” symptoms being “typical” for women or that women as a group do not always present with typical symptoms. These physicians were using knowledge of atypical symptoms as a goal-modified stereotype (Burgess et al. 2006). That is, physicians consciously applied their knowledge that women have atypical symptoms for CHD with the goal of enhancing comprehension, and this influenced their interpretations of the symptoms.

This finding underscores that symptoms are not static stimuli but rather are actively interpreted by a provider. Given that vignette patient-actors of both sex-gender groups presented symptoms with the same verbal and nonverbal signals, the differential interpretation of symptoms for women and men was constructed by the physicians in an attempt to make sense of patient-specific information. This result provides an additional case of the active construction of biological differences (Fausto-Sterling 2000).

In the language of symbolic interactionism, the subset of physicians who invoked atypical symptoms were confronted with a stimulus (patient presentation of symptoms) and engaged in a process of actively assigning meaning to the stimulus within a social context, which in turn shaped their behavior (O’Brien 2006). The evidence that social factors contribute to the interpretation of symptoms does not mean that biology and evidence-based medicine are completely constructed. Rather, results from this study indicate that the way in which medical knowledge is applied (regardless of the actual biological basis) can contribute to variation in clinical decisions.

A full review of the literature regarding the biological basis of sex-gender differences in CHD is beyond the scope of this article, but it is relevant that a review of research examining differential symptoms of myocardial infarction by sex-gender revealed inconsistent results (Chen, Woods, and Puntillo 2005). Although studies have documented non–chest pain symptoms more often in women than men, there also is evidence of “more similarities than differences” in CHD symptoms (Milner et al. 1999), no difference in reports of chest pain by men and women (Goldberg et al. 1998), women having a similar or slightly higher prevalence of self-reported angina than men (Hemingway et al. 2008), and chest pain not always being the chief complaint for either women or men (Milner et al. 2004). The lack of a clear consensus may explain why physicians who invoked atypical symptoms did not reference a proportion of women who present with atypical symptoms, as would be expected if statistical discrimination were the mechanism at work.

Instead, the lowered diagnostic certainty among some physicians may reflect an unintended consequence of the label “atypical.” Framing research findings about some women’s experiences in opposition to an established norm (i.e., the “typical” CHD symptoms believed to be more often experienced by men) may inadvertently convey that this category of symptoms is inherently less certain. That some physicians in this sample used “atypical” along with “vague” and “nonspecific” supports this interpretation. Framing symptoms associated with a social group in terms of difference (rather than expanding the normative symptoms to include the full range) may create a “double-edged sword” in practice.

These findings indicate that physicians participate in the common human practice of using generalized knowledge to aid in interpreting information and that the framing of medical knowledge may influence their interpretations in unintended ways. Just as the naming of a diagnosis provides meaning to patients and occurs in a social frame (Jutel 2009), the label attached to group-based differences in symptoms shapes the meaning of those symptoms. Analysis of this data set showed that differential interpretations of symptoms and the attached diagnostic certainty contributed to variation in clinical decisions, particularly regarding treatment decisions appropriate for an urgent cardiac situation. The finding that only a subset of physicians in the sample applied generalized knowledge about atypical symptoms and that this resulted in lower certainty for a portion of these physicians appears
to be in line with the reduced magnitude of the sex-gender disparity in CHD treatments.

**Limitations and Future Research**

This study’s experimental design brings important advantages but also potential limitations. The strong internal validity of an experimental design is offset by a risk to external validity from using video vignettes rather than observing actual patient-provider encounters. As previously described (Lutfey et al. 2010), considerable effort was made to ensure the clinical authenticity of the video vignette, as evidenced by 89.8 percent of respondents reporting that the vignette patient was “very typical” or “reasonably typical” of their patients. In addition, respondents viewed the vignette in the context of their practice day and were instructed to respond to the patient’s symptoms as they typically would in their practice.

The experimental design prioritizes the assembly of a purposive sample so that physician characteristics of interest (sex-gender and experience level) are varied systematically. This limited the feasibility of pursuing a larger sample. For examining a disparity that has reduced in magnitude over time, the difference that remains is apparent in only a subset of patient/physician encounters, which further limits the sample size of interest. In addition, because of characteristics of the population of primary care physicians, we were unable to systematically vary respondents by other potentially important factors (e.g., race-ethnicity or practice type).

Future research is needed in several areas. We do not provide a statistical test of the full pathway. Our quantitative results taken together with previously published results from the same data set demonstrate the full pathway, but future analyses should test the full pathway simultaneously using a structural equation model. Diagnostic certainty as a mediator between physicians’ interpretations of patient sex-gender and CHD management also needs to be tested against other potential mediating factors. In addition, our data set does not allow for a quantitative test of the use of stereotyping or prejudice, and results from a prior statistical analysis of our data that found evidence against the use of statistical discrimination (Maserejian et al. 2009b) need to be replicated.

The causal direction of the relationship between uncertainty and stereotyping (or other heuristic devices) needs further examination. Previous research suggests that uncertainty opens a space for the use of heuristic devices, such as stereotypes (Balsa et al. 2003; Smedley et al. 2003); however, we demonstrate that the use of a goal-modified stereotype can create uncertainty rather than the other way around.

Also unclear from this analysis are why some physicians invoked the knowledge of atypical symptoms as a generalization while others did not and why using this knowledge had a “double-edged” effect on treatment decisions. More research is needed to understand what factors (e.g., practice culture) may explain this variation.

In conclusion, physicians use multiple, com- pounded heuristic devices to aid in clinical decision making, and these decision rules can either enhance or detract from optimal diagnostic and treatment decisions (Balsa et al. 2003; Bornstein and Emler 2001; Lutfey and McKinlay 2009). This analysis contributes to efforts to answer a specific question: How can we explain the reduced but persistent sex-gender disparity in CHD treatments? Findings further specify a pathway (diagnostic uncertainty) and identify a mechanism (a goal-modified sex-gender stereotype) that can account for at least part of the remaining disparity. Taken together with previous analyses, the cumulative evidence suggests that invoking the notion that women have “atypical symptoms” lowers diagnostic certainty for some physicians; in turn, lower diagnostic certainty reduces physician ordering of “urgent” CHD medications and tests. These results extend our knowledge about how nonmedical factors can lead to variation in clinical decisions and, ultimately, disparities in health care.

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NOTES
1. We focus on patient rather than physician sex-gender because empirical evidence showed no significant difference by physician sex-gender for CHD diagnostic certainty or for ordering tests and medications (Lutfey et al. 2010). Unpublished analysis showed no interaction effect between physician and patient sex-gender for physicians’ CHD certainty or treatment decisions. In our analysis, physician sex-gender had a significant influence on ordering a nonurgent medication or an urgent test, but this was not related to diagnostic certainty (the focus of this analysis).
2. The quantitative analysis used three sets of logistic models for four outcomes: ordering an urgent medication, a nonurgent medication, a test only, or an urgent test. Set 1 included patient sex-gender and the other design variables, set 2 added diagnostic certainty, and set 3 added the interaction term. Details are available from the corresponding author.
3. Although respondents applied the generalized belief of “atypical symptoms,” they did not invoke the widely recognized sex-gender stereotype that women’s physical complaints often stem from a psychological cause. Details are available from the corresponding author.

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Bios
Lisa C. Welch is director of the Center for Qualitative Research at New England Research Institutes. Her current research focuses on health disparities, clinical decision making, and help seeking.

Karen E. Lutfey is an associate professor of health and behavioral sciences at the University of Colorado Denver. While at New England Research Institutes, she was co–principal investigator for the study on which this article is based. Her research interests include medical decision making, stigma, health disparities, and health policy.

Eric Gerstenberger is a research scientist/biostatistician at New England Research Institutes, where he works on multiple projects, including clinical trials, registries, and clinical decision-making research.

Matthew Grace is a graduate student in the Department of Sociology at Indiana University and was a research assistant at New England Research Institutes during the analysis for this article. His research interests include the patient-provider relationship, social networks, and health disparities.