Medical Student Bias and Care Recommendations for an Obese versus Non-Obese Virtual Patient

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Abstract

Objective—This study examined the independent effect of a patient's weight on medical students' attitudes, beliefs, and interpersonal behavior toward the patient, in addition to the clinical recommendations they make for her care.

Design—Seventy-six clinical-level medical students were randomly assigned to interact with a digital, virtual female patient who was visibly either obese or non-obese.

Methods—Interactions with the patient took place in an immersive virtual clinical environment (i.e., virtual reality) which allowed standardization of all patient behaviors and characteristics except for weight. Visual contact behavior was automatically recorded during the interaction. Afterward, participants filled out a battery of self-report questionnaires.

Results—Analyses revealed more negative stereotyping, less anticipated patient adherence, worse perceived health, more responsibility attributed for potentially weight-related presenting complaints, and less visual contact directed toward the obese version of a virtual patient than the non-obese version of the patient. In contrast, there was no clear evidence of bias in clinical recommendations made for the patient's care.

Conclusion—Biases in attitudes, beliefs, and interpersonal behavior have important implications because they can influence the tone of clinical encounters and rapport in the patient-provider relationship, which can have important downstream consequences. Gaining a clear understanding of the nature and source of weight bias in the clinical encounter is an important first step toward development of strategies to address it.

Keywords

obesity; patient-provider interaction; stigma; provider attitudes

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The worldwide prevalence of obesity is high and has steadily grown[1]. Accordingly, the proportion of patients with obesity seen in primary care systems is also quite high. Despite the frequency of encounters between clinicians and patients who are obese, many providers hold negative attitudes toward these individuals[2-6]. In turn, a number of studies demonstrate that obese patients report negative clinical experiences, poor treatment, and stigmatizing behavior by health care providers[5, 7-13]. These experiences are posited to contribute to avoidance of cancer screening and other preventive health services among persons who are obese[14-16].

Health care providers' attitudes toward people who are obese are consistent with those of the general public. Indeed, research indicates that many physicians perceive individuals who are obese to be highly responsible for causing their condition[2, 17, 18] and endorse stereotypes that they are lazy and lacking in self control[2, 19]. A corollary to these beliefs is providers' tendency to perceive obese patients as being unmotivated and non-compliant[20]. These attitudes and beliefs can shape the clinical interaction making it more negative and uncomfortable for patients who are obese[21, 22] and decreasing patient-provider rapport. Negative attitudes can also be subtly conveyed in interpersonal behaviors[23, 24]. The degree to which a provider makes eye contact with a patient, for example, can reflect the level of his or her regard for that patient. These nonverbal behaviors color the tone of the medical encounter and influence patient satisfaction[25].

Though provider attitudes and beliefs about patients with obesity can clearly be impactful in the clinical encounter, previous studies have largely been limited to surveys of general attitudes. Each interaction between a provider and a patient occurs in a complex clinical context with a multitude of clinical and interpersonal variations. Thus, there are numerous characteristics of the patient and aspects of the interaction aside from patient weight that could initiate or exacerbate negative attitudes. Many of these variables, however, can be confounded with a patient's weight, making it difficult to pinpoint the source of negative attitudes reported in surveys. For example, patients who are obese tend to have different co-morbidities or different health status than patients who are not obese[26]. Patients who are obese may also exhibit different interaction styles,[27] developed through previous experiences with weight bias and negative treatment. Similarly, providers' expectations about patients who are obese may elicit negative interaction styles from these patients (i.e., self-fulfilling prophecies)[28]. General surveys do not account for these factors. Thus, there is little evidence on the extent to which bias against and negativity toward obese patients is activated by the patient's weight, as opposed to factors that arise during the medical encounter.

In addition to affecting rapport with patients, providers' attitudes toward obese patients might also influence their decisions about patient care. Indeed, individuals' biased attitudes are often linked to related behaviors[29]. Only two known studies have attempted to examine the link between provider attitudes and patient care behavior. Thus far, findings are mixed. Wigton and McGaghie found no differences in providers' psychiatric-related

recommendations in response to viewing video tapes of actors playing obese or non-obese patients[30]. Hebl and Xu reported finding differences in providers' test ordering for obese versus non-obese patients based on hypothetical chart review[31]. If provider biases about obese patients do lead to differences in clinical decision making, this could clearly have important implications for patient health. Gaining a clear understanding of the nature of weight bias in the clinical encounter is an important first step toward development of strategies to address it.

It is extremely difficult to examine the effect of a single clinical variable, like patient weight, in a real medical setting. Actual clinician-patient encounters are un-standardized and cannot be manipulated for experimental purposes. Even standardized patients or actors are unable to completely standardize their verbal and nonverbal behavior. There is therefore a need for a highly controlled examination of the effects of patient weight within the context of a medical encounter.

To accomplish this, we employed immersive virtual environment (IVE) technology (i.e., virtual reality) which allows experimental manipulation of clinical variables, while maintaining total patient standardization in a realistic clinical context[32, 33]. In IVEs, users are immersed in a digitally created environment. This is realized using a combination of graphics software and a carefully designed user interface to create three-dimensional environments that users can navigate in a natural way (e.g., by walking). This technology also allows tracking of users' visual gaze, which can serve as a subtle indicator of bias[34].

To examine the effect of patient weight on provider attitudes, beliefs, and behavior, we immersed clinical-level medical students (in their third or fourth years of training) in an IVE interaction with a virtual female patient who was visibly either obese or non-obese. The patient presented with two potentially weight-related complaints, knee pain and shortness of breath, and one non-weight-related complaint, eczema. We chose to focus on a medical student population because they are a likely target of intervention or education efforts aimed at improving clinical interaction with obese patients.

We had three main hypotheses:

1. Students will exhibit more negative attitudes and have more negative beliefs about the obese patient than the non-obese patient (negative stereotyping, labeling her as less likely to be adherent, labeling her as less healthy, and assigning her more responsibility for causing her potentially weight-related presenting complaints).

2. Students will exhibit less visual contact with the obese patient than the non-obese patient.

3. Students who interact with the obese patient will exhibit more reliance on lifestyle-related clinical recommendations for her potentially weight-related concerns, and thus make fewer recommendations for diagnostic follow-up for her shortness of breath, and for symptom management for her knee pain.

Methods

Design

This study was an experiment in which students were randomly assigned to one of two conditions: interaction with an obese or a non-obese version of the same digital patient (see Figure 1). Data for this study were obtained from a larger experimental project examining the impact of genetics information provision to medical students.

Participants

Participants were recruited from the Washington, DC and Baltimore, MD metropolitan areas. They included 76 third and fourth year medical students. Thirty-seven were randomly assigned to the obese patient, 39 to the non-obese patient condition. Because we used IVE technology, exclusion criteria included having a seizure or vestibular disorder, being highly prone to motion sickness, and having poor, uncorrected hearing or vision. Participants were compensated $100 for their participation.

Procedure

This study was approved by the governing Institutional Review Board. Each student completed one experimental session lasting approximately an hour. The study was described to students as an investigation of patient-provider interaction in virtual environments; we did not communicate any study aims related to obesity until debriefing. After students consented to participate in the study, they completed a task in which they were asked to read and describe a short article on a medical topic. The content of the article was unrelated to any other portion of the study. Following this task, students engaged in an IVE-based interaction with a virtual female patient who was either obese or not depending upon assigned condition. Students wore a head-mounted display to interface with the virtual environment. Their head and body movements were tracked using an optical and inertial tracking system to render the appropriate scene in real time. Scenes were rendered stereoscopically, producing a three-dimensional virtual world. Students' movements in the virtual environment were recorded for later analysis.

The virtual encounter with the patient was a primary care-type clinical encounter. We constrained communication and interaction so that each student would receive the same type and amount of information from the patient. All aspects of the virtual patient and her history were identical between the obese and non-obese versions with the exception of her reported body weight, her reported BMI, and her visible body size.

Students 'entered' the virtual clinic room by wearing the head-mounted display and were directed to look at a virtual computer monitor within the environment. This monitor provided information and instructions to guide students though the interaction. The patient's chart information was then displayed on the computer monitor (see Figure 2). All details were identical for the obese and non-obese patients (blood pressure, pulse, temperature, medications, etc.) with the exception of weight and BMI. The obese patient's weight was reported as 247 pounds with a BMI of 39.9, and the non-obese patient's weight was reported

as 134 pounds (BMI=21.6). When students were finished reviewing the patient information, they saw the patient for the first time.

Next, a turn-taking clinical interaction between the student and the patient took place. The student introduced him or herself to the patient. The patient verbalized information about her current health symptoms and concerns. Specifically, the patient reported that she currently had a rash on her hand that she believed to be eczema, that she was experiencing knee pain previously diagnosed as osteoarthritis, and she had been experiencing some intermittent shortness of breath. After the patient finished speaking, the student had an opportunity to visually examine the patient (e.g., taking a closer look at the eczema rash on her hand). The student responded verbally to the patient with whatever content he or she felt was appropriate, and the interaction was ended.

Following the virtual encounter, students completed a battery of computerized questionnaires. Afterward they were weighed and measured for height. Finally, students were fully debriefed and dismissed.

Measures

Students completed several measures indicating their attitudes toward and beliefs about the patient following the interaction. All scale responses were collected using seven-point Likert-type scales. Attitude and belief measures are described in the order of presentation.

Beliefs about patient's health—We measured students' beliefs about how healthy the patient was with four items previously used by Hebl and Xu[31]. Originally, each was a single item that was part of a larger battery of assessments. We created a scale from the four items related to perceptions of the patients' health status. Items assessed beliefs about how healthy the patient is, how well the patient takes care of herself, the patient's self-discipline, and the seriousness of the patient's health condition. Scale endpoints included "not at all" and "extremely." The scale we created from these items showed good reliability (Cronbach's alpha = .76).

Perceptions of patient's adherence—We measured students' perceptions of the patient's likelihood to adhere to their advice with a single item taken from the same battery of items described above[31]. The item was worded, "this patient would follow my advice." Scale endpoints included "not at all" and "extremely."

Negative stereotyping—We measured students' attitudes about the patient using a negative stereotype scale based on the Obese Persons Trait Survey[35] (Cronbach's alpha = .91). The scale consists of ten negative traits (e.g., laziness). Students were asked to indicate the extent to which each trait described the patient. Scale endpoints were "strongly disagree" and "strongly agree."

Perceptions of patient's responsibility—The extent to which students believed the patient was responsible for causing each of her three presenting complaints (eczema, shortness of breath, and knee pain) was assessed with a single item for each, e.g., "how

responsible is your patient for causing her eczema?" Scale endpoints were "not at all responsible" and "entirely responsible".

Visual contact—We unobtrusively measured the extent of visual contact students made with the virtual patient during the interaction. The IVE system recorded the direction of each student's gaze twice every second. These data were run through a computer program to determine the extent to which the patient's face was central in the participant's view over the course of the exam period.

Clinical recommendations—Prior to answering any of the attitude or belief items, students were asked to generate an open-ended list of the follow-up recommendations they would make after this initial visit for each of the patient's complaints (eczema, shortness of breath, and knee pain). Students were prompted with three broad categories: diagnostic tests, medication-related treatment, and non-medication-related treatment. Responses were tabulated. To capture the most common recommendations, we included recommendations in analyses only if at least 20% of students in either condition made a given recommendation.

Demographics—Demographic variables such as gender, age, race and ethnicity, year in medical school, and family history of obesity were collected last among the self-report measures. Students' weight and height were measured directly using a scale and tape measure at the conclusion of the visit.

Statistical Analysis

Analyses were performed using SPSS version 17.0 (SPSS Inc., Chicago IL). Statistical significance was assessed at p<.05. Descriptive analyses of all variables were performed. For clinical recommendations, chi square analyses were used to assess differences between the two conditions. For all other attitude and behavior variables, comparisons between the two conditions were performed using 1-way ANOVAs. We included participant gender as a covariate in attitude and belief analyses as these can differ between male and female providers[19, 36]. We also initially performed analyses with student BMI (kg/m^2) as a covariate, however, BMI was not a significant covariate so it was removed from the analyses reported here.

Results

Participant characteristics are presented in Table 1. Students assigned to each condition did not significantly differ from one another on any demographic characteristic.

Attitudes and Beliefs

Unadjusted means and standard deviations are reported in Table 2. Students endorsed significantly higher levels of negative stereotypes when they interacted with the obese version of the patient than the non-obese version of the patient, $F(1,73)=49.64$, $p<.0001$. Students also rated the obese patient as less likely to adhere to their advice, $F(1,73)=7.42$, $p<.01$. Finally, students rated the obese patient as being less healthy than the non-obese patient, $F(1,73)=54.16$, $p<.0001$.

In addition, the obese patient was rated as more responsible for causing the presenting complaints that could be construed as weight-related, but not the unrelated condition. That is, the obese patient was held significantly more responsible for causing her shortness of breath, $F(1,73)=26.37$, $p<.0001$, and her knee pain, $F(1,73)=36.11$, $p<.0001$, but there was no difference in student ratings of the obese and non-obese patients' responsibility for causing the eczema.

Visual Contact

Students had the patient's face in view a lower percentage of the time (i.e., made less visual contact) when the patient was obese (M=29%, SD=13) than when she was not obese (M=37%, SD=18), $F(1,74)=6.31$, $p<.05$.

Clinical Recommendations

We assessed students' clinical follow-up recommendations for the two presenting complaints that could be construed to be weight-related; knee pain and shortness of breath. Comparisons of recommendation rates between the two conditions are presented in Table 3. We assessed the extent of reliance on lifestyle-related follow-up recommendations (weight loss, diet, exercise) versus symptom management recommendations for knee pain, and versus diagnostics for shortness of breath.

Comparisons of recommendation categories for shortness of breath by condition revealed that students were more likely to recommend lifestyle changes when the patient was obese than when she was not obese, χ^2 (1, N =76) =14.6, $p<.0001$. They were less likely to recommend symptom management (i.e., bronchodilator prescription) for shortness of breath when the patient was obese, χ^2 (1, N =76) =4.8, $p<.05$. There was, however, no significant difference in recommendation rates for diagnostic tests. Comparison by condition of recommendation categories for knee pain resulted in no significant differences; students in the obese and non-obese patient conditions recommended lifestyle, symptom management, and diagnostic follow-up at similar rates.

Discussion

In this study we found increased negative stereotyping, less anticipated patient adherence, worse perceived health, more responsibility attributed for potentially weight-related presenting complaints, and less visual contact directed toward the obese version of a virtual patient than the non-obese version of the patient. This pattern occurred in response to the size of the patient alone, as all other interaction variables and all potential confounders were held constant. Unlike previous studies that used videotaped actors or written vignettes[30, 31], use of an IVE clinical 'simulation' allowed us to disentangle the effect of patient weight from other factors while maintaining psychological realism and immersion in the experimental scenario. Previous research has shown that experiences in virtual environments are psychologically compelling[37]. Virtual patients generally elicit reactions similar to standardized patients in training scenarios[38, 39]. Behavior in these simulations can also translate to behavior in real clinical interactions[39, 40].

The attitude and belief outcomes reported here are important in their own right and can have substantial impact on patients' experiences of the medical encounter. Furthermore, Epstein and Street[41, 42] posit a model through which negative interpersonal interactions in the clinic can contribute to obese individuals' avoidance of preventive care, as demonstrated in the literature[13-15]. In the model, factors like clinician-patient rapport and patient satisfaction are considered 'proximal outcomes' of the clinical interaction. These proximal outcomes can influence health directly and also influence 'intermediate outcomes' such as a patient's commitment to treatment, which impacts health. The current study demonstrated one concrete example of negative interpersonal behavior in that students exhibited decreased visual contact with the obese patient. Visual contact is a proxy for eye contact, a behavior that is linked to empathy expression by providers. Eye contact is part of a constellation of nonverbal behaviors that reflect providers' regard for patients and that are linked to patient satisfaction[25].

We anticipated that differences in beliefs and attitudes would affect students' clinical recommendations for the obese patient. Although there were some individual clinical recommendations that differed between the obese and non-obese versions of the patient in the current study, we did not find pervasive patterns indicative of bias. Though we found no clear evidence of bias, there were some differences in rates of individual recommendations that are of interest. The differences we found between conditions (e.g., for lifestyle-related treatment recommendations) were not inappropriate when the patient's body weight was used as clinical data in the decision-making process. It is worth noting, however, that some of the individual recommendations that differed between the obese and non-obese patient, weight loss and lipid profile in particular, though medically reasonable, may be less germane to short-term workup or symptom relief. Other recommendation differences (minimizing knee stress, heat and cold application, and bronchodilator prescription) might also indicate weight-related assumptions about factors causing the patient's symptoms. Such recommendations, therefore, may be indicative of an understanding that the obese patient is less healthy, less active, or should lose weight generally. Further research should explore beliefs and assumptions behind these subtle differences in recommendation patterns.

We did not find evidence to support our hypothesis that students would rely on lifestyle recommendations to address the obese patient's potentially weight-related symptoms and would thus be less thorough with respect to symptom management and diagnostics. There are several possible reasons for this. In general, diagnosis, treatment, and management of conditions like knee pain and shortness of breath involve protocols[43, 44] that these students are likely to have recently learned. Behaviors that largely depend upon protocol and habit are less likely to be influenced by one's attitudes and beliefs[45]. Thus, it may be the case that the particular symptoms examined here did not leave students leeway to express their attitudes. Previous research has similarly shown little influence of patient characteristics on management plans for shortness of breath whereas these characteristics influenced recommendations for a different symptom[46]. Alternatively, some students in our sample may not yet have been well-versed in these protocols and thus may have made more recommendations across the board so as not miss anything. More research is warranted to disentangle these issues. Regardless, in this study, the attitudes and beliefs students reported

toward obese patients seem to hold more implications for the quality of the clinical encounter than for care recommendations.

In examining these findings it is also of note that participant BMI was not a significant predictor in our analyses. Thus, students who had higher BMIs did not exhibit lower levels of bias. This finding extends the currently mixed literature[6] on whether providers' weight impacts their attitudes and/or beliefs about patients who are obese.

The current study has several limitations. This study focused on medical students. Although we chose this sample because students are a clear target for potential interventions, they are still in the midst of their clinical training. Thus, the current findings may be less generalizable to practicing physicians and other clinicians. Furthermore, although we were able to measure and report students' nonverbal visual contact during the clinical interaction, we did not include other measures of interpersonal behavior or interaction quality. This is in part because the communication between the students and the virtual patient was constrained to keep it constant between participants and between conditions. In the future, examining additional verbal and nonverbal behaviors could shed more light on how attitudes and beliefs impact interpersonal behavior during a medical encounter. In addition, several of our measures consisted of a single item. More in depth assessments may increase validity of belief and attitude measurement in future studies.

Another limitation was the fact that we did not include assessments of whether and the extent to which participants perceived the patient as being obese. The virtual patient did appear to have a somewhat smaller body type than would be typical of someone with a BMI of 39.9. Based on the fact that the vast majority of students recommended weight loss for the patient, however, it clear that the patient was generally perceived as being overweight or obese. Finally, we did not allow for a true physical examination or interview during the clinical interaction. We provided students with several pieces of clinical information (e.g., blood pressure, smoking status) and included a visual examination period in which students could take a closer look at the patient. However, students were not able to perform any other type of examination that might have informed their diagnostic and treatment recommendations. For this initial study we opted to keep the interaction simple. In the future, however, making the flow of the interaction more similar to reality may increase external validity.

Further exploration of the patient-provider relationship and how obesity stigma plays out in this complex interaction is warranted. Experimental work focusing on the patients' experiences in the interaction will aid in understanding processes at work when they report negative encounters with providers. In turn, explication of these processes will help to identify points of intervention where we might improve patient-provider interactions for patients who are obese.

The current findings demonstrate that patients who are obese can trigger negative, biased attitudes, beliefs, and differential interpersonal behavior based on their size alone, in the absence of particular interaction styles, health characteristics, or other differences. Even though these attitudes and beliefs did not translate into biases in patient care

recommendations, they have important implications in their own right. Negative attitudes and biases can influence the tone of clinical encounters and rapport in the patient-provider relationship, both of which can have important downstream consequences. It is therefore important to develop strategies for mitigating the effects of these reactions to patients who are obese.

Acknowledgments

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Figure 1.
View of the virtual clinic room with a) the non-obese version of the patient and, b) the obese version of the patient

Patient Information

Name: Taylor, Jennifer C.   DOB: 12/21/66
Gender: F   Age: 41

Vitals

Height: 5ft, 6in   Temp: 98.4
Weight: 134 lbs.   BP: 120/70
BMI: 21.6   Pulse: 72

Current Medications: None

Comments: Patient is coming in for an annual exam

Figure 2.
Electronic health record displayed to students who interacted with the non-obese patient.
The record for the obese version of the patient differed only in reported weight and BMI.

Table 1

Participant Characteristics by Condition, Unadjusted Means and Standard Deviations

Characteristic	Total	Obese Patient Condition (N=37)	Non-Obese Patient Condition (N=39)	*p* value
Age, years Mean (SD)	26.2 (1.9)	26.1 (1.8)	26.4 (2.0)	.45
BMI, kg/m² Mean (SD)	23.9 (3.6)	23.4 (3.4)	24.2 (3.8)	.33
Female gender	43 (57%)	22 (59%)	21 (54%)	.62
White*	45 (59%)	22 (59%)	23 (59%)	.97
Asian	24 (32%)	11 (30%)	13 (33%)	.74
Black/African American	11 (14%)	8 (22%)	3 (8%)	.09
Hispanic/Latino	2 (3%)	1 (3%)	1 (3%)	.97
3rd year medical student	33 (43%)	18 (49%)	15 (38%)	.37
4th year medical student	43 (57%)	19 (51%)	24 (62%)	.37
Overweight or Obese BMI	29 (38%)	12 (32%)	17 (44%)	.32
Family History of Obesity	26 (34%)	13 (35%)	13 (33%)	.87

Numbers represent frequencies and percentages unless otherwise noted

*Racial percentages add up to >100% because participants were allowed to select more than one race category

Table 2
Attitudes and Beliefs about the Patient, Unadjusted Means and Standard Deviations

	Total	Obese Patient Condition	Non-Obese Patient Condition	*p* value
Negative Stereotyping	3.21 (1.0)	3.85 (0.86)	2.60 (0.72)	<.0001
Perceptions of Patient's Adherence	4.67 (1.2)	4.30 (1.3)	5.03 (1.18)	<.01
Beliefs about Patient's Health	4.01 (0.86)	3.44 (0.69)	4.56 (0.64)	<.0001
Perceptions of Patient's Responsibility for Causing Presenting Complaints				
Eczema	2.50 (1.4)	2.70 (1.4)	2.31 (1.2)	NS
Shortness of Breath	3.36 (1.4)	4.11 (1.2)	2.64 (1.3)	<.0001
Knee Pain	3.49 (1.3)	4.19 (1.1)	2.82 (1.1)	<.0001

Table 3

Most Common Recommendations for Follow-Up of Shortness of Breath and Knee Pain by Condition, Frequencies and Percentages

	Total	Obese Patient Condition (N=37)	Non-Obese Patient Condition (N=39)	Chi square test[*] and p value
Shortness of Breath				
Lifestyle	*25 (33%)*	*20 (54%)*	*5 (13%)*	$\chi^2 = 14.6, p<.0001$
Weight Loss	12 (16%)	12 (32%)	0 (0%)	$\chi^2 = 15.0, p<.0001$
Exercise	17 (22%)	12 (32%)	5 (13%)	$\chi^2 = 4.21, p=.040$
Diet	8 (11%)	7 (19%)	1 (3%)	$\chi^2 = 5.40, p=.020$
Diagnostic	*68 (89%)*	*34 (91%)*	*34 (87%)*	$\chi^2 = 0.5, NS$
X-Ray	43 (57%)	22 (59%)	21 (54%)	$\chi^2 = 0.2, NS$
Electrocardiogram	23 (30%)	14 (38%)	9 (23%)	$\chi^2 = 2.0, NS$
Pulmonary Function Tests	37 (49%)	14 (38%)	23 (59%)	$\chi^2 = 3.4, p=.065$
Complete blood count	15 (20%)	10 (27%)	5 (13%)	$\chi^2 = 2.4, NS$
Lipid Panel	10 (13%)	9 (24%)	1 (3%)	$\chi^2 = 7.9, p=.005$
Symptom Management	*11 (14%)*	*2 (5%)*	*9 (23%)*	$\chi^2 = 4.8, p=.029$
Bronchodilators	11 (14%)	2 (5%)	9 (23%)	$\chi^2 = 4.8, p=.029$
Knee Pain				
Lifestyle	*28 (37%)*	*15 (41%)*	*13 (33%)*	$\chi^2 = 0.4, NS$
Weight Loss	16 (21%)	12 (32%)	4 (10%)	$\chi^2 = 5.6, p=.018$
Exercise	18 (25%)	7 (19%)	11 (28%)	$\chi^2 = 0.91, NS$
Diagnostic	*51 (67%)*	*24 (65%)*	*27 (70%)*	$\chi^2 = 0.16, NS$
X-Ray	51 (67%)	24 (65%)	27 (70%)	$\chi^2 = 0.16, NS$
Symptom Management	*74 (97%)*	*36 (97%)*	*38 (97%)*	$\chi^2 = .001, NS$
Over-the-counter Medication	73 (96%)	36 (97%)	37 (95%)	$\chi^2 = 0.30, NS$
Physical Therapy	13 (17%)	8 (22%)	5 (13%)	$\chi^2 = 1.0, NS$
Minimize Knee Stress	11 (14%)	2 (5%)	9 (23%)	$\chi^2 = 4.8, p=.029$
Rest	15 (20%)	10 (27%)	5 (13%)	$\chi^2 = 2.4, NS$
Heat and/or Cold	33 (43%)	21 (57%)	12 (31%)	$\chi^2 = 5.2, p=.022$

[*] Chi square degrees of freedom=1, N=76 for each test