What Is Most Important to Patients when Deciding about Colorectal Screening?

Avlin Imaeda, MD, PhD^{1,2}, Danielle Bender, MD^{1,2}, and Liana Fraenkel, MD, MPH^{1,2}

¹Clinical Epidemiology Research Center, VA CT Healthcare System, West Haven, CT, USA; ²LMP 1080, Department of Internal Medicine, Yale University School of Medicine, New Haven, CT, USA.

BACKGROUND: Colorectal cancer (CRC) screening can be administered through tests with varied characteristics and is a preference-sensitive decision.

OBJECTIVE: To assess patient experiences with a Maximum Differences Scaling (MDS) tool for eliciting values about CRC screening test characteristics and determine whether patients vary in how they prioritize test characteristics and whether this variation relates to test preferences.

DESIGN: MDS survey to elicit patients' values for characteristics related to fecal occult blood testing, sigmoidoscopy, colonoscopy, CT colonography and colon capsule endoscopy.

PARTICIPANTS: 92 patients enrolled in primary care clinics at a VA hospital and associated university.

RESULTS: Patients reported that the tool was easy to use (95%). On completion 62% would choose colonoscopy, 23% colon capsule endoscopy and 10% CT colonography. Of the attributes evaluated, patients valued sensitivity, risk of tear and need for a second test most. Sensitivity was more important to those choosing colonoscopy than those choosing other tests (median importance=21.5 versus 19.6, $p<0.01$). Concern with complications and sedation was positively associated with age ($p<0.001$ and $p<0.001$), whereas concern with colon preparation and missing work was negatively associated with age ($p<0.009$ and $p<0.03$). Patients with fair or poor health status were less concerned with sensitivity than patients in good to excellent health (median importance=19.3 versus 21.4, $p<0.008$).

CONCLUSIONS: This pilot study suggests that patients vary in how they prioritize colorectal cancer screening test attributes; this variation is associated with test preferences, and this MDS tool is feasible to use and may help patients construct their preferences.

KEY WORDS: colorectal cancer screening; maximum differences scaling; decision tool; patient preferences; shared decision making.

Presented in abstract form at *Digestive Diseases Weekly* June 2009, Chicago, IL.

Electronic supplementary material The online version of this article (doi:10.1007/s11606-010-1318-9) contains supplementary material, which is available to authorized users.

Received June 17, 2009

Revised October 20, 2009

Accepted February 16, 2010

Published online March 23, 2010

J Gen Intern Med 25(7):688-93

DOI: 10.1007/s11606-010-1318-9

© Society of General Internal Medicine 2010

Shared decision making as well as following patient preferences is recognized as an important part of delivering ethical medical care¹. A large literature has found that patients vary widely in their preferences and underscores the need to include patients preferences in the treatment planning process^{2,3}.

Colorectal cancer (CRC) screening decisions require an evaluation of multiple options and therefore should ideally include an assessment of patient preferences. Colon cancer is the third leading cause of cancer deaths in men and women and colorectal cancer (CRC) screening by a variety of methods decreases mortality⁴⁻¹². FOBT, sigmoidoscopy, colonoscopy, CT colonography, barium enema, fecal DNA or immunochemical testing are all options for CRC screening. Colon capsule endoscopy, which involves swallowing a capsule that photographs the colon, is currently available in Europe and is expected to soon be available in the US^{13,14}. Patient preferences for CRC screening options have been examined through surveys¹⁵⁻¹⁷. Additionally, a number of decision aids, mostly utilizing videotaped informational sessions, have been developed¹⁸⁻²². More recently, conjoint analysis has been used to evaluate patient preferences for CRC screening tests²³⁻²⁷. Most of these studies asked patients to choose a favored test among two to three scenarios with five to seven different attributes on each of several different combinations. Because choice tasks ask patients to trade-off between specific estimates of specific characteristics, they can be lengthy and complex, and therefore may not be the most efficient method for facilitating decision making in a busy practice setting.

We therefore chose to examine the value of a simplified decision aid asking patients to consider the general characteristics of CRC screening tests. We used Maximum Differences Scaling (MDS) to enable patients to evaluate competing treatment characteristics. We hypothesized that patients will vary in how they prioritize specific test characteristics and that their preferences will relate to their choice of screening test^{2,3}. In addition, given that patients vary in their preference to participate in decision making and that many rely on their physician's opinions, our goal was to develop a tool to guide discussion and choice of CRC screening with a patient's physician. As a first step we implemented this test in a convenience sample. In this paper we describe the attribute rankings in our population; evaluate the correlations between

patient characteristics, attribute rankings and test preferences and assess patient experiences with use of the tool.

reported by the facility. Patients with a prior history of CRC screening were not excluded. The study protocol was approved by the human studies committees at both sites.

METHODS

Participants

Consecutive patients were recruited from the waiting rooms in the primary care clinics of a Veterans Administration (VA) hospital and an associated university. They were asked to give verbal consent to participate in the study. Inclusion criteria were age 49 (contemplating screening) or older. The study was begun prior to recent USPSTF guidelines recommending discontinuing screening in most patients over age 75²⁸. We excluded patients who reported a history of CRC or colectomy, and those unable to read and write English. Patient-reported screening rates in the VA participants were similar to those

Data Collection

Subjects' values for 12 characteristics (listed in text box 1) related to CRC screening were quantified using MDS (Sawtooth Software®). Before beginning the MDS survey, we presented subjects with informational material about CRC screening and a description of the following tests: FOBT, flexible sigmoidoscopy, colonoscopy, CT colonography and colon capsule endoscopy (see online appendix 1). We chose to include colon capsule endoscopy as it is expected to soon be available in the US. We did not include fecal DNA or immunochemical testing because these tests have similar attributes to FOBT.

- The rare risk of a problem from sedation that would require hospitalization.
- How good the test is at finding polyps and preventing cancer.
- The need to collect your stool and spread a small sample on a card on three separate days.
- The risk of pain or discomfort from the test.
- The need to get a ride home after the test.
- The need to take a day off from work or activities for the test.
- The need to clean the bowel by drinking a prep before the test.
- The rare risk that the capsule can get stuck and need to be removed with endoscopy or an operation.
- The need to have a tube in the rectum to have the test done.
- The need to have a second test (colonoscopy) to remove a polyp.
- The rare risk of a tear or bleeding from the procedure that would require an operation.
- The need to swallow a capsule to have the test done.

Attributes were selected based upon literature review and the opinions of six physicians and six patients. After completing the MDS survey, subjects completed a questionnaire to ascertain demographic and health characteristics (age, gender, marital status, ethnicity, race, education, occupation, self-reported health status), prior colorectal cancer screening (yes/no), experiences using the tool (ease of use, educational benefit, utility of the task) and which test

for colorectal cancer screening they would prefer (see online appendix 2).

The MDS task and paper survey were administered in one session, lasting less than 20 min, by one of two investigators (AI, DB). The number of patients choosing not to participate was not recorded; however, of those who agreed, only one interview was aborted for an appointment. All others completed the task. No incentive was offered.

Analyses

MDS was developed as an alternative to rating and ranking tasks by Jordan Louviere in 1987 based on random utility theory and represents an extension of Thurstone's law of comparative judgment²⁹. MDS has robust scaling properties and is able to effectively discriminate between items³⁰. This approach asks respondents to choose the best (or the most important) item from a series of sets containing different combinations of items from a master list (see example in Fig. 1). Unlike rating scales, scale-related bias is not a concern with MDS because respondents make choices instead of using rating scales. MDS generates ratio data and provides estimates of the absolute importance, as well the relative importances, of all included items. One of the significant differences between MDS and conjoint analysis is that MDS asks patients to trade-off attributes; conjoint analysis asks subjects to trade-off between levels of each attribute. While MDS can handle levels, it is well suited to examining how subjects prioritize salient features inherent to the decision under consideration. This significantly shortens and simplifies the task for the patient. This also limits the ability to generate a preference structure to identify a particular test as the preferred test.

We report the rank order of attributes and the mean (SD) ratings, median and interquartile ranges of each attribute. The mean rating scores are generated using Hierarchical Bayes (HB) analysis (Sawtooth Software HB module). HB modeling can derive stable scores at the individual level even though each respondent evaluates a fraction of all possible subsets of items. In HB modeling the samples averages are used to update the individual utilities in a number of iterations until estimates are stabilized. After this convergence the cycle is run a few thousand more times, and the estimates of each iteration are saved and averaged^{31,32}. The scores were rescaled to sum to 100 to facilitate interpretation. HB programming is built into the MDS software. We examined the associations between subject characteristics and importance ratings using Spearman's correlation coefficient and the Mann-Whitney U test for continuous and categorical variables, respectively. We also report the percent of patients agreeing that the program was

Table 1. Subjects' Characteristics

Characteristic	Number (%) (total=92)
Race and ethnicity	
White only	66 (75)
Black only	18 (20)
Hispanic	5 (5)
Education level	
No high school	5 (5)
Some high school	12 (13)
High school or equivalent	24 (26)
Some or 2 year college	30 (33)
4 year college graduate	13 (13)
Graduate degree	9 (10)
Marital status	
Single, never married	10 (11)
Married/partner	44 (48)
Widow	12 (13)
Separated/divorced	26 (28)
Occupation	
Work full-time	19 (21)
Work part-time	8 (9)
Retired	48 (49)
Unemployed/disabled	20 (21)
Health status, self-reported	
Excellent	6 (7)
Very good	28 (30)
Good	34 (37)
Fair	21 (23)
Poor	3 (3)
Prior colon cancer screening	78 (85)
Prior colonoscopy	67 (75)
History of refusal of screening	27 (29)
Site	
Veterans hospital	75 (82)
University hospital	17 (18)

easy to use, helped them understand test options and helped them choose a screening test.

RESULTS

Ninety-two subjects were interviewed; 84% were male, and their mean (range) age was 65 (49–80). The remaining subject characteristics are presented in Table 1.

After performing the survey, 95% of patients reported that the program was easy to use; 97% reported that the program helped them to understand the test options; 92% responded that the program helped them to choose a screening test. Of the 29% who had refused screening at some point, 85% reported that they would be willing to undergo CRC screening with their preferred test.

Attribute Importances

The distribution of importances that subjects assigned to each attribute is presented in Table 2. Overall, subjects viewed the sensitivity of the test, the rare risk of a perforation/tear and the potential need for a second test as most important. However, subjects varied considerably in their opinions as indicated by wide interquartile ranges for many attributes. An example of this variability is provided in Figure 2, a graph of two individual subject's ratings. The older patient preferred FOBT and the younger colonoscopy.

Considering only these 4 things, which Matters the Most to you?

Please click on one circle only.

Matters the Most	
☐	The need to have a second test (colonoscopy) to remove a polyp.
☒	The rare risk that the capsule can get stuck and need to be removed with endoscopy or an operation.
☐	The need to take a day off from work or activities for the test.
☐	The need to have a tube in the rectum to have the test done.

Figure 1. Example of a MDS question. Figure 1 shows an example page, 1 of 12, of various combinations and arrangements of the attributes, which patients responded to in the survey.

Table 2. Rank Order of Attribute Importances

Attribute	Mean (95% CI)	Median	Interquartile range
Sensitivity of test	19.2 (18.3–20.1)	20.4	17.4–22.1
Risk of a tear	15.2 (14.0–16.4)	17.3	10.5–20.3
Need for a second test	13.7 (13.0–14.5)	13.8	11.6–16.0
Risk of capsule getting stuck	10.2 (8.7–11.6)	9.7	2.7–17.0
Need for sedation	9.1 (7.8–10.3)	7.9	3.35–14.7
Risk of pain	7.8 (6.7–8.8)	5.6	3.9–10.7
Need for colon prep	8.1 (6.4–9.7)	5.2	1.0–15.5
Need for a tube in the rectum	7.2 (6.0–8.3)	4.8	2.3–10.8
Need to smear stool on a card	3.7 (2.6–4.8)	1.1	0.5–3.9
Need for a ride	2.6 (1.4–3.9)	0.1	0.1–0.4
Need to swallow a capsule	1.7 (1.3–2.1)	1.1	0.7–1.9
Need to miss work	1.6 (0.8–2.2)	0.4	0.2–1.0

Associations Between Subject Characteristics and Attribute Importances

We found no significant associations between race/ethnicity, education status or history of screening. Concern with the risk of the capsule getting stuck and the need for sedation were positively associated with age (Spearman coefficients 0.33 $p < 0.001$ and 0.32 $p < 0.001$), whereas concern with colon preparation and the need to miss work was negatively associated with age (Spearman coefficients -0.3 $p < 0.009$ and -0.22 $p < 0.03$). Age was not associated with the importance subjects assigned to the remaining attributes.

Overall, the need to miss work was not important compared to other attributes; however, employed subjects did assign

greater importance to this attribute than unemployed subjects (median importance employed 0.9 unemployed 0.4 $p < 0.001$). Subjects reporting fair or poor health status were more concerned with the need to have a tube in the rectum (median importance 9.7 for fair or poor health and 4.5 for good to excellent health $p < 0.02$) and less concerned with sensitivity (median importance for fair or poor health 19.3 and 21.4 for good to excellent health $p < 0.008$) compared to those reporting good to excellent health status. No other statistically significant associations between subject characteristics and attribute importances were identified.

Test Preferences

After completing the computer task, patients were asked to choose their preferred screening test: 62% chose colonoscopy, 23% chose colon capsule, 10% CT colonography, 4% FOBT and 1% sigmoidoscopy. Subjects preferring colonoscopy assigned greater importance to the sensitivity of the CRC screening test (median importance=21.5 versus 19.6, $p = 0.01$) compared to those preferring less invasive procedures. There were no other statistically significant differences in importance ratings between those preferring colonoscopy and subjects preferring less invasive procedures.

DISCUSSION

In this pilot study, we tested the ability of MDS to elicit patients' preferences for attributes relevant to CRC screening tests. This tool may be useful for improving shared decision making because it is relatively quick and fairly easy for patients to use, incorporates both patient education and

Figure 2. Illustrative rank ordering of all attributes for two individuals. Figure 2 shows the rank order of all the attributes for two individual patients. Black bar: 79-year-old man, unemployed, fair health status, preferred FOBT. Grey bar: 50-year-old man, employed, good health status, preferred colonoscopy. The labels are as follows: Second: the need to have a second test; Swallow: the need to swallow a capsule; Tube: the need to have a tube in the rectum; Work: the need to take a day off from work; Ride: the need to get a ride home; Pain: the risk of pain; Sed: the rare risk of a problem from sedation; Prep: the need to clean the bowel by drinking a preparation; FOBT: the need to collect your stool on cards; Stuck: the rare risk that the capsule can get stuck; Tear: the rare risk of a tear or bleeding; Sensitivity: how good the test is at finding polyps and preventing cancer.

patient preferences, and provides a framework for patients to discuss and choose a test with their physician. A graph like Figure 2 generated from the MDS survey could be used to stimulate discussion between a primary care physician and a patient about which test would be best for them.

As expected, patients varied in how they prioritized CRC screening test characteristics. In particular, concern for invasiveness of the test and willingness to trade-off sensitivity were associated with age and health status. Overall, however, subjects rated sensitivity of the CRC screening test as the most important attribute. Sensitivity was also found to be important to patients in other studies^{17,25,26} and correlated with preferring colonoscopy as it did in ours^{17,25}. However, a rating-scale-based conjoint analysis in a racially diverse population found that patients were more concerned with test process than accuracy²⁵. This latter difference may have related to population differences as the patients in the rating-scale analysis were more racially diverse, had a higher percentage of women and less education. However, rating scale versus choice-based task differences may have contributed. We were surprised that “prep” was not important to most subjects, as in clinical practice many patients complain about this. Possibly, this attribute was not ranked high because it is required for all CRC screening tests except FOBT, which was not a preferred test in this population. A second unexpected finding was the population did not rank the risk of pain as important. This may be because most subjects had prior screening by colonoscopy (75%) and reported a positive or neutral experience with the test (91%). Two prior conjoint analysis studies also found that pain was considered less important than test accuracy and process^{25,26}. However another study found that pain was important, particularly to screening naïve patients, although less important than effectiveness and preparation²⁴.

Consistent with a large amount of literature describing patient preferences for different health care decisions, we found that subjects varied in their preferences for CRC screening tests^{33–36}. What is surprising and interesting in our population is that despite high levels of satisfaction with prior colonoscopy, a significant proportion of patients would choose colon capsule or CT colonography over colonoscopy. Most other groups have found that colonoscopy is not the most preferred study^{37–41}, although a survey study in a veteran population similarly found that colonoscopy was the preferred test⁴². In the conjoint analysis survey by Marshall et al. in which screening rates were lower, 30% of patients preferred no screening; the preferred test for patients desiring screening was CT colonography²⁶. Hawley et al. did not find an association between prior screening with endoscopy and choice of screening test, and the preferred tests in their study were fecal immunochemical testing and CT colonography. They did not find an association with gender²⁵. However, female gender has in the past been associated with lower screening rates by colonoscopy, so the preferred test in our study may not have been colonoscopy if our population included more females^{43,44}.

Some of the attributes in our study may have had complex relationships, i.e., the risk of pain and the need for sedation. Depending on perceived relationships, this may have impacted individual results. Additionally, our tool was not designed to address directionality or levels of attributes as has been done with conjoint analysis^{24–26}. This may have affected our results as ambiguity in the meaning of the attribute may affect

selection of the attribute. However, inclusion of directionality for all test characteristics would have made the survey much more complex. Moreover, in contrast to conjoint analysis surveys, which require directionality to predict preference for specific options, our intention was to enable patients to prioritize characteristics (regardless of direction) in order to then be able to discuss their preferences with their physician.

Because the majority of patients had prior CRC screening by colonoscopy (75%), the reported preferences in our population may not be broadly applicable to populations with low screening rates or less exposure to colonoscopy. This is a significant limitation, as is the relative homogeneity of our population including mostly white, male patients. We did not consider cost in our study. This affects comparison of our results with other preference studies as this attribute is known to be important to patients^{15,16}. We chose not to address cost as the actual costs to individuals would have varied widely among non-veterans. In reality, cost and insurance coverage would limit the number of possible options available to patients, inflating the importance assigned to this attribute and limiting evaluation of other attributes. Additionally, we did not include frequency of screening as an attribute. Although frequency is important to patients, the interval for a given patient is difficult to predict as the results of the test impact the recommended screening interval.

In addition to “test sensitivity,” we have specifically evaluated patient’s value of attributes related to mode of the individual tests as has been done in recent conjoint analysis studies. We have additionally evaluated patient’s values for specific complications; these have not been included in most other decisional tools other than one study that evaluated risk of complications, but not specific complications²⁴. The latter appears to be important as older patients in our study were concerned about the need for sedation and the risk of a capsule getting stuck.

Our results add to literature underscoring the need to incorporate patient preferences into a shared decision-making process. This pilot study suggests that patients vary in how they prioritize colorectal cancer screening test attributes, this variation is associated with test preferences, and a MDS tool may help patients construct their preferences.

Acknowledgements: Dr. Fraenkel is supported by the K23 Award AR048826-01 A1

Conflict of Interest: None disclosed.

Corresponding Author: Avlin Imaeda, MD, PhD; LMP 1080, Department of Internal Medicine, Yale University School of Medicine, 310 Cedar St., New Haven, CT 06510, USA (e-mail: Avlin.Imaeda@yale.edu).

REFERENCES

1. **Beauchamp T, Childress J.** Principles of Biomedical Ethics. New York: Oxford University Press; 1983.
2. **Allicock M, Sandelowski M, DeVellis B, Campbell M.** Variations in meanings of the personal core value “Health”. Patient Educ Counsell. 2008;73:347–53.
3. **Reyna V.** A theory of medical decision making and health: fuzzy trace theory. Med Decis Making. 2008;28:850–65.
4. **Mandel J, Bond J, Church T,** for the Minnesota colon cancer control study, et al. Reducing mortality from colorectal cancer by screening for fecal occult blood. N Engl J Med. 1993;328:1365–71.

5. **Kronborg O, Fenger C, Olsen J, Jorgensen O, Sondergaard O.** Randomised study of screening for colorectal cancer with faecal-occult-blood test. *Lancet*. 1996;348:1467-71.
6. **Hardcastle J, Chamberlain J, Robinson M, et al.** Randomised controlled trial of faecal-occult-blood screening for colorectal cancer. *Lancet*. 1996;348:1472-7.
7. **Winawer S, Zauber A, Ho M, The National Polyp Study Group, et al.** Prevention of colorectal cancer by colonoscopic polypectomy. *N Engl J Med*. 1993;329:1977-81.
8. **Newcomb P, Norfleet R, Storer B, Surawicz T, Marcus P.** Screening sigmoidoscopy and colorectal cancer mortality. *J Natl Cancer Inst*. 1992;84:1572-5.
9. **Muller A, Sonnenberg A.** Protection by endoscopy against death from colorectal cancer. *Arch Intern Med*. 1995;155:1741-48.
10. **Selby J, Friedman G, Quesenberry C, Weiss N.** A case-control study of screening sigmoidoscopy and mortality from colorectal cancer. *N Engl J Med*. 1993;329:653-7.
11. **SEER Stat Fact Sheet; colon and rectum.** National Cancer Institute. Available at: <http://seercancer.gov/statfacts/html/colorecthtml> Accessed June 3, 2009.
12. **Jemal A, Siegel R, Ward E, et al.** Cancer statistics. *CA Cancer J Clin*. 2008;58:71-96.
13. **Eliakim R, Fireman Z, Gralnek I, et al.** Evaluation of the PillCam™ Colon capsule in the detection of colonic pathology: results of the first multicenter, prospective, comparative study. *Endoscopy*. 2006;38:963-70.
14. **Schoofs N, Deviere J, Van Gossun A.** PillCam™ colon capsule endoscopy compared with colonoscopy for colorectal tumor diagnosis: a prospective pilot study. *Endoscopy*. 2006;38:971-7.
15. **Pignone M, Bucholtz D, Harris R.** Patient preferences for colon cancer screening. *J Gen Intern Med*. 1999;14:432-7.
16. **Pignone M.** Patient preferences for colon cancer screening: the role of out-of-pocket costs. *Am J Managed Care*. 2007;13:390-92.
17. **Schroy P, Lal S, Glick J, Robinson P, Zamor P, Heerem T.** Patient preferences for colorectal cancer screening: how does stool DNA testing fare? *Am J Managed Care*. 2007;13:393-400.
18. **Pignone M, Harris R, Kinsinger L.** Videotape-based decision aid for colon cancer screening. A randomized, controlled trial. *Ann Intern Med*. 2000;133:761-69.
19. **Dolan N, Frisina S.** Randomized controlled trial of a patient decision aid for colorectal cancer screening. *Med Decis Making*. 2002;22:125-39.
20. **Griffith J, Lewis C, Brenner A, Pignone M.** The effect of offering different numbers of colorectal cancer screening test options in a decision aid: a pilot randomized trial. *BMC Med Inform and Decis Making*. 2008;8:4-9.
21. **Griffith J, Fichter M, Fowler F, Lewis C, Pignone M.** Should a colon cancer screening decision aid include the option of no testing? A comparative trial of two decision aids. *BMC Med Inform and Decis Making*. 2008;8:10-9.
22. **Kim J, Whitney A, Hayter S, et al.** Development and initial testing of a computer-based patient decision aid to promote colorectal cancer screening for primary care practice. *BMC Med Inform and Decis Making*. 2005;5:36-47.
23. **Ruffin M, Fetter P, Jimbo M.** Preference-based electronic decision aid to promote colorectal cancer screening: Results of a randomized controlled trial. *Prevent Med*. 2007;45:267-73.
24. **Van Dam L, Hol L, Bekker-Grob E, et al.** What determines individuals' preferences for colorectal cancer screening programmes? A discrete choice experiment. *Eur J Cancer* 2009;(2009). doi:10.1016/j.ejca.2009.07.014.
25. **Howley S, Volk R, Krishnamurthy P, Jibaja-Weiss M, Vernon S, Kneuper S.** Preferences for colorectal cancer screening among racially/ethnically diverse primary care patients. *Med Care*. 2008;46:S10-6.
26. **Marshall D, Johnson F, Phillips K, Marshall J, Thabane L, Kulin N.** Measuring patient preferences for colorectal cancer screening using a choice-format survey. *Value Health*. 2007;10:415-30.
27. **Dolan J.** Patient priorities in colorectal cancer screening decisions. *Health Expect*. 2005;8:334-44.
28. **U.S Preventative Services Task Force USPST.** Screening for colorectal cancer: US Preventive Services Task Force recommendation statement. *Ann Intern Med*. 2008;149:627-37.
29. **Louviere, J.** The best-worst or maximum difference measurement model: Applications to behavioral research in marketing. The American Marketing Association's Behavioral Research Conference Phoenix, Arizona 1993.
30. **Flynn T, Louviere J, Peters T, Coast J.** Estimating preferences for a dermatology consultation using Best-Worst Scaling: comparison of various methods of analysis. *BMC Med Res Methodol*. 2008;8:76-88.
31. **Understanding HB: An intuitive approach.** Richard M. Johnson. Sawtooth Software. 2000. Available at: <http://www.sawtoothsoftware.com/download/techpap/undhb.pdf> Accessed October 5, 2009.
32. **MaxDiff analysis: simple counting, individual-level logit, and HB.** Bryan Orme. Sawtooth Software, Inc. Available at: <http://www.sawtoothsoftware.com/download/techpap/inivmaxdiff.pdf> Accessed October 5, 2009.
33. **Fraenkel L, Chodkowski D, Lim J, Garcia-Tsao G.** Patients' preferences for treatment of hepatitis C. *Med Decis Making* 2009. doi:10.1177/0272989X09341588.
34. **Fraenkel L, Bogardus S, Concato J, Felson D, Wittink D.** Patient preferences for treatment of rheumatoid arthritis. *Ann Rheum Dis*. 2004;63:1372-8.
35. **Longacre A, Imaeda A, Garcia-Tsao G, Fraenkel L.** A pilot project examining the predicted preferences of patients and physicians in the primary prophylaxis of variceal hemorrhage. *Hepatology*. 2008;47:169-76.
36. **DeBourcy A, Lichtenberger S, Felton S, Butterfield K, Ahnen D, Denberg T.** Community-based preferences for stool cards versus colonoscopy in colorectal cancer screening. *J Gen Intern Med*. 2007;23:169-74.
37. **Almog R, Ezra G, Lavi I, Rennert G, Hagoel L.** The public prefers fecal occult blood test over colonoscopy for colorectal cancer screening. *Eur J Cancer Prevent*. 2008;17:430-37.
38. **Ling B, Moskowitz M, Wachs D, Pearson B, Schroy P.** Attitudes toward colorectal cancer screening tests. A survey of patients and physicians. *J Gen Intern Med*. 2001;16:822-30.
39. **Leard L, Savides T, Ganiats T.** Patient preferences for colorectal cancer screening. *J Fam Pract*. 1997;45:211-18.
40. **Nelson R, Schwartz A.** A survey of individual preference for colorectal cancer screening technique. *BMC Cancer*. 2004;4:76.
41. **Wolf R, Basch C, Brouse C, Shmuckler C, Shea S.** Patient preferences and adherence to colorectal cancer screening in an urban population. *Am J Public Health*. 2006;96:809-11.
42. **Powell A, Burgess A, Vernon S, et al.** Colorectal cancer screening mode preferences among US veterans. *Prevent Med*. 2009;49:442-48.
43. **McGregor E, Hilsden R, Li F, Bryant H, Murray A.** Low uptake of colorectal cancer screening 3 years after release of national recommendations for screening. *Am J Gastro*. 2007;102:1727-35.
44. **Meissner H, Breen N, Klabunde C, Vernon S.** Patterns of colorectal cancer screening uptake among men and woman in the United States. *Cancer Epidemiol Biomarkers Prev*. 2006;15:389-94.