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The Impact of Screening, Medical Treatment and Invasive Interventions on Patients' Medical Decision-Making Styles: A Cross-Sectional Study with Inferences to the United States Population

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Abstract

Background: Although positive benefits are associated with shared decision making, no previous studies have evaluated the impact of condition on how shared decision making is implemented.

Objective: To compare decision-making preferences across three conditions associated with screening, medical treatment, and invasive interventions: Screening tests for colorectal cancer, initiation of prescription medication for hypertension, and surgical treatment for hip or knee osteoarthritis.

Methods: We made use of the publicly available National Survey of Medical Decisions (the DECISIONS study) data and our sample comprised of all subjects who completed the following three specific modules of the decisions study: Colorectal cancerscreening tests, high blood-pressure medication, and knee or hip replacement surgery. Our primary outcomes of interest were (1) Who made the final decision? (2) Extent of patients' involvement in the decision, and (3) How confident they were about their decision.

Results: When comparing baseline characteristics across the three conditions, the group undergoing screening was youngest with a mean age of 58.7 years compared to the medication group (61.27 years), while the group undergoing surgery was oldest (63.14 years). Females constituted over half of all three groups (greater than 50%). In the invasive interventions, decisions were made mainly by the patients, unlike the other groups where shared decision making was predominant. Most patients in all three groups preferred high levels of participation in decision making. Patients undergoing surgery were significantly more likely to have greater confidence in their decisions, followed by patients with medication for hypertension.

Conclusion: Shared decision making is less predominant among invasive interventions. Further research should describe the reasons for the limited use of shared decisions among conditions with invasive interventions, along with its consequences for healthcare quality.

Keywords: Shared decision making; Medical decision making; Patient outcomes

Introduction

Shared decision making is an integrative patient-provider communication process in which both groups of individuals work together to make an informed clinical decision, thus enhancing the chances of treatment success based on clinical evidence and the patient's informed preferences [1,2]. Shared decision making in healthcare leads to many positive patient outcomes, including increased satisfaction with treatment and knowledge acquisition, more accurate risk perception, lowered level of decisional conflict, improved treatment adherence, and better clinical outcomes [3]. In spite of positive results, the percentage of beneficial outcomes varies extensively across studies [4]. One possible explanation for this variation is that the context of shared decision making might alter its impact on results, one example of a change in the context being the different types of interventions associated with the decision. To our knowledge, however, few previous studies have evaluated how a condition and its corresponding intervention might affect who makes the final treatment decision under real-world circumstances. For example, we are unsure how the use of shared decision making might vary across conditions requiring (a) A regular screening, (b) Life-long drug treatment, and (c) Major, potentially-recurring surgical interventions.

The U.S. Preventive Services Task Force (USPSTF) advocates shared decision making as an effective strategy for increasing patient adherence to cancer screening programs [5,6]. Shared decision-making processes assisted by decision aids increase colorectal screening uptake, reduce decisional conflict by helping patients identify a preferred screening option, and enhance patient knowledge and satisfaction [7,8]. Although these interventions have increased colorectal cancer screening, the overall impact was relatively modest with no effect on further implementation of shared decision-making processes in cancer-screening practices [8,9]. While 70% of patients preferred to engage in shared decision making for preventive health decisions, only 47% indicated that a shared decision-making process occurred during their visit for colorectal cancer screening [9], thus indicating a lack of

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concordance between patient preferences for shared decision making and the colorectal cancer screening process [9].

Given this gap in the literature, the objective of our study is to compare decision-making preferences across three situations with screening, medical treatment, and invasive interventions: Screening tests for colorectal cancer, initiation of prescription medication for hypertension, and surgical treatment for hip or knee osteoarthritis. We hypothesize that the impact of testing, care, and invasive interventions will lead to an increased utilization of shared decision making, or a decision being jointly made by clinicians and patients.

Materials and Methods

Study design

This study compared decision-making preferences across three conditions with screening, medical treatment, and invasive interventions: Screening tests for colorectal cancer, initiation of prescription medication for hypertension, and surgical treatment for hip or knee osteoarthritis. We described our manuscript in agreement with the STROBE (STrengthening the Reporting of OBservational studies in Epidemiology) guidelines [10] and secured ethical approval from the Institutional Review Board of the University of Basilicata, Italy.

Setting

We made use of the National Survey of Medical Decisions (the DECISIONS study), a random-digit-dial telephone survey conducted between November 2006 and May 2007 by the Survey Research Center (SRC), Institute for Social Research, at the University of Michigan. The data from this survey is freely available for investigators at http://www.icpsr.umich.edu/icpsrweb/ICPSR/studies/25983 (last accessed July 2017). Participants were asked to complete a set of screening questions regarding each of the decision types to identify whether they had either taken a remedial action or discussed taking that action with a healthcare provider for one of the nine common medical decisions in the past two years. This included decisions related to (1) initiate prescription medications for hypertension, hypercholesterolemia, and depression, (2) cancer screening tests for prostate, colorectal, and breast cancer and (3) elective surgical procedures for knee or hip replacement, cataracts, and low back pain. Their responses determined eligibility for complete decision-specific modules. The exact details of the sampling, instrument development, and data collection methodology are described elsewhere [11].

In our study, we evaluated the subset of English-speaking patients aged 40 years and above providing responses about (1) Screening tests for colorectal cancer such as colonoscopy, sigmoidoscopy, stool blood test and barium enema, (2) Drug treatment for hypertension, and (3) Elective surgical interventions for knee or hip replacement. Patients eligible for these modules had, in the past two years, either undergone screening tests for colorectal cancer, started medication for hypertension and had a total or partial surgical replacement of a knee/hip or had discussed with a health care provider. The following questions in all the three modules addressed measures of the decision-making process, including the content and structure of patient-health care provider discussions: Source of information and decision attributes rated as important in making decisions, and patients' ratings of the decision.

Participants

Our sample comprised all subjects who completed the following three specific modules of the DECISIONS study: Colorectal cancer screening tests, high blood-pressure medication, and knee or hip replacement surgery.

Outcomes

The primary outcome measures were the decision-making preferences of members undertaking the specific modules including the following variables: (1) Who made the final decision, mainly categorized into the patient, the healthcare provider, and a shared decision between the two. (2) The extent of patients' involvement in the decision, preferences being a lot less, little less, about the same, little more or a lot more. (3) How confident they were about their decision, scored from 0 to 10 where 0 was not at all confident, and 10 was most confident.

Predictors

Our main predictors were conditions in the three specific modules of the DECISIONS study: Colorectal cancer screening tests, high blood-pressure medication, and knee or hip replacement surgery.

Strata

Variables used for stratification were (1) Who made the final decision (patient, provider or both). (2) The extent of patients' involvement in the decision-making (less, same or more). (3) How confident they were about their decision (scored as 0 to 10 where 0=not at all confident and 10=most confident).

Potential confounders

Our main potential confounders were (1) Age; (2) Gender; (3) Health assessment using a 5-point scale (1= Excellent, 2=Very good, 3=Good, 4=Fair, 5=Poor); (4) Have a personal healthcare provider; (5) Education (1=Some High school or less, 2=High school graduate, 3=Some College or Technical school, 4=College graduate, 5=Postgraduate); (6) Marital status (1=Married/living together, 2=Separated, 3=Divorced, 4=Widowed, 5=Never married), (7) Race (White, Black, Other); (8) Hispanic or Latino; (9) Insurance coverage and (10) Income (1=Less than $25,000, 2=Between $25,000 and $49,999, 3=Between $50,000 and $74,999, 4=Between $75,000 and $99,999, 5=More than $100,000).

Statistical methods

Our exploratory analysis commenced with a visual exploration of all variables to evaluate the frequency, percentage and near-zero variance for categorical variables like who made the final decision and the extent of patients' involvement in the decision-making, distribution for numeric variables for eg., how confident were patients in making their decision, and their corresponding missing value patterns [12]. Near zero variance is found when a categorical variable had a small percentage of a given category. Variable transformations and dummy coding for variables with distributions that were not normal at inspection, variable re-categorization or removal for near-zero variation, and different imputation algorithms for variables with missing values.

For descriptive statistics, all variables with a 10-point response scale were split at their median value into dichotomous variables since their distribution was highly skewed. Patients' preferred involvement was recategorized from a 5-point scale (a lot less, little less, about the same, little more, and a lot more) to a 3-point scale (less, about the same, and more) to avoid having categories with very low frequencies. For reporting the dichotomous variables with patient reports of the decision-making process, we included only the "yes" response in the result tables.

Since this dataset is representative of a larger population, namely the United States population, we adjusted all of our analyses for the corresponding set of weights (multipliers relating the sample to the total population), strata (subpopulations) and primary sampling units (sample aggregates). These adjustments allow for inferring our results to the larger population rather than being applicable only to our study sample. In our study, these inferences have two significant implications. First, for each of our frequencies, we report on the number of individuals in both our study sample as well as in the corresponding overall population to whom these results apply. Second, our confidence intervals are adjusted to the target population. In other words, our results represent the relationship between decision-making preferences relating to screening, medical treatment and invasive interventions across three conditions in the United States population among those above 40 years old. Comparisons between groups are made by verifying the overlap in confidence intervals between different estimates, with significant differences being indicated by non-overlapping confidence intervals.

All analyses were performed using the R language [13] and the following packages: ggplot2, survey, and rmarkdown.

Results

The analyses present the characteristics of participants adjusted for the corresponding set of weights, strata and primary sampling units and can be generalized to the United States population aged 40 and older. For example, frequencies are described for the target population of the United States, with significant differences between groups indicated by non-overlapping confidence intervals. Table 1 displays socio-demographic characteristics with inferences to the total United States population. When comparing baseline characteristics across the three conditions, the group undergoing screening was younger than the medication group, while the group undergoing surgery was older. Females comprised more than half of all three groups (greater than 50%), this being more pronounced among those undergoing screening procedures (53.3% ± 5.9%). Most participants were white, high school graduates, and married. Over 90% of all respondents presented health insurance and a primary care provider. Employment rates among those undergoing screening and medication were 54.6% (± 2.3%) and 44% (± 2.4%), respectively, with a corresponding reported income between $25,000 and $49,999. In contrast, those undergoing surgical interventions reported an income of at least $25,000, with a corresponding employment rate of 35.6% ± 5.7%. A total of 36.5%

Variable	Screening tests for Colorectal CA (119,891,219)	Medication initiation for High Blood pressure (106,174,032)	Surgical intervention for Arthritis (15,672,520)
Female	61,125,950 (51% ± 2.2%)	55,260,285 (52% ± 2.4%)	8,346,024 (53.3% ± 5.9%)
Age (y)	58.69 (± 0.36)	61.27 (± 0.46)	63.14 (± 1.02)
Education			
- High school or less	6,513,097 (5.4% ± 0.8%)	12,677,069 (11.9% ± 1.3%)	1,057,703 (6.7% ± 1.8%)
- High school graduate	41,507,716 (34.6% ± 1.8%)	40,706,951 (38.3% ± 2.1%)	6,092,899 (38.9% ± 5.3%)
- Some college	25,312,216 (21.1% ± 1.5%)	22,227,186 (20.9% ± 1.7%)	3,902,217 (24.9% ± 4.8%)
- College graduate	25,729,069 (21.5% ± 1.5%)	17,347,045 (16.3% ± 1.5%)	2,469,983 (15.8% ± 3.8%)
- Postgraduate	20,829,121 (17.4% ± 1.3%)	13,215,782 (12.4% ± 1.2%)	2,149,717 (13.7% ± 3.3%)
Marital status			
- Married/Living together	86,376,564 (72% ± 2.5%)	66,794,334 (62.9% ± 2.7%)	9,927,110 (63.3% ± 7.3%)
- Separated	2,191,157 (1.8% ± 0.5%)	2,407,246 (2.3% ± 0.6%)	365,005.4 (2.3% ± 1.9%)
- Divorced	14,670,144 (12.2% ± 1.1%)	14,421,036 (13.6% ± 1.4%)	2,057,672 (13.1% ± 3.4%)
- Widowed	10,353,313 (8.6% ± 0.8%)	16,552,060 (15.6% ± 1.2%)	2,645,423 (16.9% ± 2.9%)
- Never married	6,300,040 (5.3% ± 0.8%)	5,999,356 (5.7% ± 0.9%)	677,309.5 (4.3% ± 1.6%)
Currently have health insurance	112,499,471 (93.8% ± 2.7%)	97,602,423 (91.9% ± 3%)	14,616,253 (93.3% ± 8.4%)
Income			
- Less than $25,000	20,674,219 (17.2% ± 1.4%)	28,718,417 (27% ± 1.9%)	4,840,266 (30.9% ± 4.8%)
- Between $25,000 and $49,999	31,250,879 (26.1% ± 1.7%)	29,121,078 (27.4% ± 1.8%)	4,111,522 (26.2% ± 4.6%)
- Between $50,000 and $74,999	23,310,647 (19.4% ± 1.4%)	17,392,834 (16.4% ± 1.4%)	1,617,029 (10.3% ± 2.5%)
- Between $75,000 and $99,999	16,895,887 (14.1% ± 1.2%)	11,654,104 (11% ± 1.1%)	1,974,992 (12.6% ± 2.8%)
- More than $100,000	27,759,586 (23.2% ± 1.5%)	19,287,599 (18.2% ± 1.6%)	3,128,711 (20% ± 4.6%)
Race			
- White	88,854,368 (74.1% ± 2%)	72,445,582 (68.2% ± 2.2%)	12,250,108 (78.2% ± 6.8%)
- Black	22,309,230 (18.6% ± 1.9%)	23,457,265 (22.1% ± 2.2%)	1,976,675 (12.6% ± 4.1%)
- Other	8,727,621 (7.3% ± 1.2%)	10,271,185 (9.7% ± 1.5%)	1,445,738 (9.2% ± 3.8%)
Hispanic	6,500,522 (5.4% ± 1%)	5,178,944 (4.9% ± 1%)	1,231,645 (7.9% ± 3.3%)
Employed	65,445,366 (54.6% ± 2.3%)	46,714,327 (44% ± 2.4%)	5,582,398 (35.6% ± 5.7%)
Health status			
- Excellent	16,752,460 (14% ± 1.2%)	9,546,465 (9% ± 1%)	1,675,577 (10.7% ± 3.3%)
- Very good	43,766,613 (36.5% ± 1.9%)	28,836,076 (27.2% ± 1.7%)	4,225,210 (27% ± 4.2%)
- Good	37,933,694 (31.6% ± 1.8%)	39,699,865 (37.4% ± 2.2%)	4,937,290 (31.5% ± 4.7%)
- Fair	15,636,313 (13% ± 1.3%)	20,423,843 (19.2% ± 1.7%)	3,129,772 (20% ± 4.3%)
- Poor	5,802,138 (4.8% ± 0.8%)	7,667,783 (7.2% ± 1.1%)	1,704,671 (10.9% ± 3.1%)
Have a primary care provider	113,491,024 (94.7% ± 2.7%)	101,230,589 (95.3% ± 3.1%)	14,643,452 (93.4% ± 8.3%)

Table 1: Participants' socio-demographic and health care characteristics by condition/intervention categories.

(± 1.9%) of all respondents in the screening group described their health as very good. Meanwhile, 37.4% (± 2.2%) and 31.5% (± 4.7%) of the interviewees in the blood-pressure medication and surgical intervention groups reported their health status to be good.

In the following table, we compare percentages across the three groups, all results being inferences to the US population. Results are deemed statistically significant when confidence intervals do not overlap between different estimates. It is most likely that patients made the final decision regarding a surgical intervention themselves; less probable that it was a shared decision with their health care provider, and rarely the decision of the health care provider alone. Decisions regarding the initiation of hypertension medication were frequently made together with the health care provider; less often by the health care provider alone and far less likely by the patients themselves. A high percentage of colorectal cancer screening decisions were made through shared decision making, followed by patient-driven decisions, and a low rate of decisions made by health care providers alone (Table 2).

Concerning the extent of involvement in decision making, patients preferred high levels of participation for all three interventions. Patients undergoing knee or hip replacement surgery were significantly more likely to have greater confidence in their decisions, followed by patients with medication for hypertension (Table 3).

Discussion

To our knowledge, this is the first study comparing who makes the final clinical decision across three conditions and corresponding interventions: Undergoing surgery for hip or knee osteoarthritis, initiating hypertensive medication, and undergoing colorectal cancer screening. In the invasive interventions group, decisions were made mainly by the patients whereas, in the other groups of intervention shared decision making (jointly made by patients and providers) was predominant. These decisions primarily depended on the risks of the process and complications for the surgical and medical treatment, whereas for screening, test-related decisions principally relied on health care provider advice. Most patients in all three groups were satisfied with their level of participation in decision making.

In contrast with what we hypothesized, shared decision-making did not increase with the nature of the different interventions. In fact, most patients in the joint surgery group described an informed decision-making process in which patients independently deliberated and made a treatment decision, while the individual physicians focused on providing education regarding treatment options [14]. Reasons for the limited use of shared decision making include scarce familiarity and training among surgeons, cost and logistical challenges related to the implementation of shared decision-making programs, and a limited comparative-effectiveness research base available for developing shared decision aids [14,15]. Another possibility is that surgeons have liability concerns due to procedural risks [16]. As a result, they might have felt discouraged to participate in decision making actively. Accordingly, a favorite maxim in the surgical field is "never talk a patient into surgery" [17]. This maxim is compatible with the low frequency of physicians openly recommending surgery in our sample (34.4%).

Most patients in our study felt satisfied with their level of decision making, possibly indicating that doctors tailored decision-making processes aligned with individual patient preferences. This practice is desirable to some extent, as patients present substantial variation in their preferences regarding decision-making participation [18]. However, the use of informed decision making is controversial for conditions patients perceive as high risk. The controversy occurs because decision-making is often a complicated process, perhaps incompatible with a health literacy level frequently achievable by most patients [14,19]. Furthermore, poor patient decisions might occur in response to stress, time pressure, unrealistic expectations, extreme risk aversion, problems in the doctor-patient relationship, as well as low-quality health information obtained from friends, family, media, and the Internet [19,20]. Since informed decision-making might increase the risk of poor outcomes, shared decision-making has been considered preferable in the surgical field [17].

Factors considered in decision making varied with different conditions probably because of perceived risks of the interventions [21]. In the colorectal cancer-screening group, patients may tacitly consider that the risk of a colonoscopy is low, while the risk of cancer is unacceptable [21]. As a result, the health care provider's opinion was often sufficient for a patient's decision to undergo screening. Another possibility is that patients were less concerned with the risks of the colonoscopy since each colonoscopy was scheduled years away from the next [22]. On the other hand, the administration of hypertensive medication is regular, and joint replacement is a definitive procedure [23,24]. Patients undergoing these interventions might have felt more concerned about long-term complications, thus appreciating other sources of information.

Despite its novelty, our study does have limitations. First, our study is observational with an analysis involving associations rather than causal models. We, therefore, argue that our results should be

Variable	Screening tests for Colorectal CA (119,891,219)	Medication initiation for High Blood pressure (106,174,032)	Surgical intervention for Arthritis (15,672,520)
Who made the final decision about the intervention			
- Mainly my decision	30,719,808 (39.6% ± 2.5%)	12,520,051 (16.6% ± 1.9%)	5,890,056 (49.8% ± 7.8%)
- Mainly the health care provider decision	4,912,435 (6.3% ± 1.1%)	15,340,643 (20.3% ± 1.9%)	957,143.6 (8.1% ± 2.4%)
- We made decision together	41,851,790 (54% ± 2.9%)	47,686,664 (63.1% ± 3.3%)	4,989,902 (42.2% ± 5.8%)

Table 2: Final decision maker and its association with conditions and their respective interventions

Variable	Screening tests for Colorectal CA (119,891,219)	Medication initiation for High Blood pressure (106,174,032)	Surgical intervention for Arthritis (15,672,520)
How much involvement in the decision would you have preferred			
- Less involvement	1,747,961 (2.3% ± 0.6%)	3,734,985 (5% ± 1.2%)	1,083,460 (9.5% ± 3.9%)
- Same involvement	66,096,326 (86% ± 3.5%)	58,736,774 (78.9% ± 3.6%)	8,738,413 (76.4% ± 8.4%)
- More involvement	9,033,814 (11.8% ± 1.6%)	11,930,026 (16% ± 1.8%)	1,619,916 (14.2% ± 4.2%)
How confident were you that the decision was correct (0 - 10)	8.72 (± 0.09)	8.91 (± 0.08)	9.08 (± 0.21)

Table 3: Patient involvement and confidence in decision making for different interventions.

interpreted with caution and in light of other experimental or causal models. Second, our results were not validated by a comparison with physicians' responses but rely on patients' perceptions. Third, our data were collected through self-reported questionnaires after the medical encounter had ensued, and so a degree of recall bias might have been in place. Future studies should address this issue. Fourth, while the study aims to control for confounding variables, some factors capable of influencing the clinician-patient relationship are not included in the survey - for example, clinical setting, the level of patient activation, the length of time living with the condition, and the presence of symptoms. All of these can affect shared decision making. Last, since our study made use of a quantitative approach to the study of decision making, our findings were restricted to either confirming or refuting our original hypotheses. The choice of a quantitative study also restricted our analyses to the variables that had been originally collected in this survey. In contrast, a qualitative approach would have enabled the discovery of themes that went beyond what was described in this report. We, therefore, encourage future researchers to combine qualitative and quantitative approaches to magnify the benefit from their data collection efforts.

In conclusion, our study suggests that shared decision making is not predominant among invasive interventions. Given the benefits associated with shared decision making, future clinical practice guidelines and healthcare policies should devise mechanisms to enhance its use across all circumstances. Further research should describe the reasons for its limited use among conditions with invasive interventions, along with its consequences for healthcare quality.

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