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Health Policy Analysis

Assessing the Role of Presurgical Information on Patient-Reported Outcomes: A Causal Analysis

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ABSTRACT

Objectives: Breast cancer poses a global burden on individuals and healthcare systems, with millions of women undergoing surgery annually. Recently, there has been growing recognition of the importance of patient-centered care, leading to increased interest in patient-reported outcome measures. In oncology, this has translated into the use of validated tools, such as the BREAST-Q survey, which is designed for a range of breast surgery procedures, and it is specifically applicable in breast cancer. Using BREAST-Q data collected at the University Hospital of Pisa (Italy) between 2018 and 2022 from a sample of 482 women, this study explores the causal relationship between the preoperative information provided by the breast surgeon and patients' postsurgery satisfaction.

Methods: We use Item Response Theory models to estimate patient-level satisfaction with presurgery information and with breast outcomes. Using these estimated latent traits, we assess the causal effect of satisfaction with presurgery information on postsurgery breast satisfaction through an exposure-response curve, accounting for various preexposure individual characteristics.

Results: Findings show a strong, positive, and statistically significant causal relationship between preoperative information and postoperative satisfaction.

Conclusions: In a healthcare landscape increasingly constrained by time and resources, healthcare organizations should note the causal link between communication and patient-reported outcomes and strive to create environments that support meaningful patient-centered interactions.

Keywords: causal effects, exposure-response curve, item response theory, physician-patient communication.

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Highlights

- Breast cancer is a global health concern; in this context, good doctor-patient communication is crucial.
- In this work, we estimate the relationship between patients' satisfaction with presurgery information provided by the surgeon and their satisfaction after breast surgery using a novel causal framework.
- Findings reveal a causal relationship between the quality of communication between the surgeon and the patient and the patient postoperative satisfaction.

Introduction

Breast cancer is a global health concern and remains a leading cause of cancer-related deaths among women, with an estimated 2.3 million new cases diagnosed annually¹⁻³ and millions undergoing surgery each year worldwide. Awareness campaigns^{4,5} and research efforts continue to play a crucial role in improving health outcomes and reducing the overall impact of breast cancer on public health.^{6,7} Although disparities in access to care remain a significant challenge, particularly in low- and middle-income countries,⁸⁻¹⁰ recent advances in treatment have improved survival rates and overall quality of life.¹¹⁻¹³ Nonetheless, patients with breast cancer often face complex treatments, including extensive surgeries and therapies, which can be overwhelming both physically and emotionally.¹⁴⁻¹⁶ In this context, a patient-centered approach,^{17,18} in which health professionals actively involve patients in their own care journey, is crucial. More broadly, the clinician-patient relationship is recognized as a foundational element of patient centeredness.¹⁹ The literature

emphasizes the significance of this reciprocal relationship, which is marked by trust, emotional connection, empathy, mutual caring, knowledge sharing, guidance, and a shared understanding of roles and responsibilities.²⁰ Within the doctor-patient relationship, effective communication seeks to establish a therapeutic alliance that facilitates accurate information exchange, supports shared clinical decision making, and ultimately contributes to improved health outcomes. By sharing needs, preferences and personal knowledge, patients can help rebalance physician-patient information asymmetries and contribute to treatment decisions, which can create added value for patients themselves. This interaction reflects value cocreation, which in healthcare broadly emerges through the exchange and integration of resources among multiple actors, with the ultimate aim of enhancing care quality and improving health outcomes.²¹⁻²⁴ Within this framework, the doctor-patient communication represents a pivotal context for resource integration that goes beyond the simple information sharing. It enables patients to be actively involved and empowered in recognizing their needs and

concerns, while providing doctors with the opportunity to tailor healthcare services for more effective and personalized outcomes. Through patient-physician interactions, patients gain significant value from receiving crucial information and guidance. At the same time, healthcare providers' roles extend beyond delivering medical information: they can understand patients' needs, expectations, and feelings, thereby fostering patient involvement in decision making.²⁵⁻²⁷ Although patients may not make final decisions about their treatments, the literature reports that being well informed helps them feel more involved, confident, and aware of their care journey. This collaborative doctor-patient relationship plays a key role in improving treatment adherence, overall experience and satisfaction, and health outcomes,²⁸⁻³⁵ especially in critical conditions, such as cancer,³⁶⁻³⁸ and in the surgical context.^{39,40}

In the context of breast surgery, some studies considered the effect of clinician's information on the quality of life and psychological well-being,^{36,41,42} others explored how information affects women's satisfaction with their breasts.^{27,42-45} Further contributions focused on selected psychosocial outcomes, such as decisions regret^{46,47} and psychological distress.^{48,49} Recent contributions pointed out that, on the other hand, ineffective communication of relevant information, both verbal and nonverbal, may lead to adverse consequences, including a mismatch between women's presurgery expectations and their postoperative outcomes,⁵⁰⁻⁵³ as well as reduced trust in the breast surgeon, which may, in turn, prompt patients to seek a second opinion.^{54,55} Indeed, studies particularly highlight how the importance of the information exchange between breast surgeons and women undergoing surgery is often underscored by the difficulties that arise when professionals do not adequately address patients' informational needs.⁵⁶⁻⁵⁹ From the methodological point of view, in most of the studies conducted in the observational setting, the analysis is often limited to associations and comparisons of pre- and postsurgical scores.^{42,43,45}

To systematically capture all the above-mentioned dynamics, patient-reported outcome measures (PROMs)⁶⁰⁻⁶² have become essential tools. PROMs play a pivotal role in understanding the patient's perspective on their own health, well-being and the impact of treatment, thus providing insights that go beyond clinical-reported endpoints. PROMs allow the integrated collection of data directly from patients regarding their feelings, functionality, and overall quality of life throughout and after treatment, providing invaluable information that goes beyond clinical outcomes. In the context of breast cancer surgeries, PROMs are important for evaluating the effects of procedures such as mastectomies and reconstructive surgeries on patients' quality of life, as well as exploring any potential challenges that patients may have encountered throughout their care journey.^{63,64} This also includes the patient's emotional well-being, body image, and satisfaction with their care experience, including interactions with the medical team. PROMs provide an opportunity for patients to reflect on whether there were any difficulties in the treatment process, such as communication barriers, or issues in the coordination between different healthcare professionals. By collecting this critical feedback, healthcare teams can identify areas in which the care pathway may need improvement, ensuring that future patients receive more supportive care. One of the most widely used tools in the field of PROMs for breast cancer surgeries is the BREAST-Q survey.⁶⁵⁻⁶⁷ BREAST-Q is an internationally validated survey designed for a range of breast surgery procedures and specifically applicable in breast cancer to assess outcomes specific to breast surgery, such as satisfaction with breasts, psychological well-being, physical well-being, and satisfaction with care (including the quality of

the patient-doctor interaction). These measures not only provide feedback on the success of medical interventions but also offer insight into how well the healthcare system supports the patient's overall recovery. Although the growing recognition of patient-centered care has led to increased interest in PROMs, there is still insufficient empirical evidence directly exploring the cause-and-effect relationship between the satisfaction with preoperative information provided by the surgeon and the post-surgery patient-reported outcome (specifically satisfaction with breast). Using BREAST-Q data from the University Hospital of Pisa (Italy), this research aims to address this gap and to explore this potential causal connection, providing data-driven evidence of the relationship's relevance. More specifically, in this work, we estimate the causal relationship between the satisfaction of presurgery information provided by the surgeon and the patient satisfaction with her breast after surgery. Both aspects are directly explored in the BREAST-Q survey, in which women are asked to provide their responses to a series of items directly measuring these 2 aspects. This choice is also consistent with previous studies exploring the effect of clinicians' information on quality of life, which consider satisfaction with breasts as the primary endpoint^{27,42-45} and the outcome that is more objective and closely related to the patient's health condition.

By analyzing responses to these items, we first measure 2 quantities at the patient level representing their (latent) overall level of satisfaction with presurgery information received and their postsurgery breast satisfaction by using Item Response Theory (IRT) models.^{68,69} IRT models are particularly useful in modeling complex individual domains that cannot be explicitly observed. Afterward, once we estimate these 2 latent traits, we estimate the causal effect of the satisfaction with information on postsurgery satisfaction through the Exposure-Response Curve (ERC),⁷⁰⁻⁷² while controlling for selected individual characteristics (sociodemographic characteristics, information on the specific surgery, characteristics of the presurgery clinical profile). ERCs are widely used in causal inference studies involving continuous exposure, operate in observational settings, where the exposure is not randomly assigned over the population, and allow researchers to account for pretreatment characteristics at the individual level.⁷⁰ ERCs go beyond purely association models and are particularly tailored to identify and assess the causal impact of a continuous exposure on an outcome. The ERC framework implies separately modeling the exposure and the outcome through proper statistical models and provides a doubly robust property, such that estimates about the causal effect of the exposure on the outcome are unbiased as long as either 1 of the 2 models are correctly specified.

To the best of our knowledge, this study is the first that estimates the causal relationship between satisfaction with information and postsurgery breast satisfaction using survey-based outcome data. By combining latent trait estimation through IRT with ERC, our work aims to mark a dual contribution: it advances patient-centered care research by providing rigorous evidence on the impact of surgeon communication on patient satisfaction, and it demonstrates the applicability of innovative causal methods in health outcomes research.

Methods

Data include individual responses to the full BREAST-Q survey (Italian validated scale), collected between March 2018 and December 2022 in the Pisa University Hospital.⁷³ The survey was administered exclusively online, before surgery and at 3 months after surgery. Eligible women were those admitted for inpatient

or day-hospital care with a (1) primary diagnosis of invasive malignant breast tumor (ICD-9-CM 174*) undergoing surgical intervention for mastectomy (ICD-9-CM 85.4*) combined with reconstruction procedures or tissue expander insertion (ICD-9-CM 85.33, 85.35, 85.7, 85.85, 85.95) or implantation of prosthesis (85.53, 85.54) performed during the hospitalization or (2) primary diagnosis of invasive or in situ malignant breast tumor (ICD-9-CM 174*, 233.0) undergoing surgical intervention for quadrantectomy (ICD-9-CM 85.20, 85.21, 85.22, 85.23, 85.24, 85.25) or reduction mammoplasty (85.31, 85.32). Eligible participants include women with primary tumors, recurrence, or reintervention for residual disease, positive lymph nodes, aesthetic improvement, and reconstructions for prophylaxis. Additionally, only those participants who provided their informed consent during one of their visits with breast surgeons or/and plastic surgeons preceding the breast surgery are enrolled for the study, with the possibility to leave the study anytime. The data collection process was developed following a defined protocol.⁷³ The final sample comprises 482 women (236 undergoing conservative surgery and 246 undergoing reconstructive surgery) who met the eligibility criteria and completed both presurgery and postsurgery surveys. Survey data provide information (1) on the rates assigned by women to statements related to the satisfaction with preoperative information provided by the surgeon and to the level of postsurgery breast satisfaction, (2) on some demographic characteristics, and (3) on aspects related to the surgery, the clinical status of the patient, and to her general health status. All items related to (1) and (3) are graded from 1 to 4 (1 = totally unsatisfied; 2 = partially unsatisfied; 3 = partially satisfied; 4 = totally satisfied).

Set Up of the Models

The sample N includes N patients, in which for a given patient j with ($j: 1, \dots, N$) we observe (1) her assigned rates to the items in I_1 , in which the generic item is indexed as i_1 , with ($i_1: 1, \dots, I_1$) and is designed to evaluate her perceived quality of the preoperative information received by the surgeon, (2) her assigned rates to the items in I_2 in which the generic item is indexed as i_2 with ($i_2: 1, \dots, I_2$) and is designed to evaluate her postoperative breast satisfaction, (3) a P -dimensional vector of baseline characteristics $X_j = \{x_{j1}, \dots, x_{jP}\}$, including demographics and clinical features. All items in I_1 and I_2 provide $K = 4$ response categories.

Item Response Theory

In the BREAST-Q survey participants are asked to indicate, on a scale ranging from 1 to 4 (1) their level of satisfaction with preoperative information received by the doctor on a series of aspects related to the surgery or to the care journey (side effects, healing and recovery time, expected appearance of breast after surgery, possible complications) and (2) their level of postsurgery breast satisfaction (body image, shape and size, comfort and fit, and natural feel). The specific questions proposed in the items differ slightly with respect to the broad class of surgery women undergo, whether reconstructive or conservative. To forecast an individual's latent perception of the satisfaction with information received from the doctor and breast satisfaction after surgery, we implemented 2 separate IRTs on the individual responses to items regarding the above dimensions that are listed in [Appendix Tables 1 and 2 of Appendix A in Supplemental Materials](#). IRT models are widely used across various social science fields to estimate latent traits by analyzing response patterns in multiple items.^{68,69} The versatility of IRT models makes them useful in diverse areas, such as education,⁷⁴⁻⁷⁶ psychology,^{77,78} and clinical research.^{79,80} In any IRT model, the core concept is understanding

how the probability of observing a correct response to an item changes with variations in the latent trait, denoted θ (person location). This probability depends on both the individual's latent trait and the item's characteristics, captured through key parameters, named difficulty (b) and discrimination (a). The difficulty parameter (b) reflects the point on the latent trait scale where the probability of success is 0.5, whereas the discrimination parameter (a) indicates how sharply the probability of success changes near the item's difficulty level. IRT models can accommodate different types of items, including binary,⁸¹ categorical,⁸² and ordinal, with specific adaptations available for each data type. Ordinal items are modeled according to a Graded Response Model (GRM).⁸³⁻⁸⁵ In this setting, we estimate 2 separate GRMs to predict the latent satisfaction with preoperative information provided by the surgeon and the latent postsurgery breast satisfaction: we denote these predicted traits as $\hat{\theta}_{I_1}$ and θ_{I_2} , respectively. Given GRM properties, the predicted latent traits follow a Standard Normal Distribution within the population (see [Appendix B in Supplemental Materials](#) for the extended GRM formulation). Latent traits are estimated separately for women undergoing conservative and reconstructive surgery because the contributing items differ slightly between the 2 surgical pathways.

Causal Inference for Continuous Exposures

After estimating the latent traits, we estimate the causal effect of the satisfaction with preoperative information on postoperative satisfaction: the exposure and the outcome are represented by the predicted traits $\hat{\theta}_{I_1}$ and θ_{I_2} , respectively. This setting implies a continuous exposure (the satisfaction of preoperative information as measured via IRT), in an observational setting, where data also provide complete information on a covariate matrix X . We outline the causal estimand of interest under the potential outcomes framework,⁸⁶⁻⁸⁸ in which the continuous intervention W_j denotes the quantity $\hat{\theta}_{I_1j}$ (with $W_j \in \mathbb{R}^+$) and the outcome Y_j identifies θ_{I_2j} . In the potential outcomes setting, for each unit j in N , we can identify a random variable $Y_j(w)$ that represents the potential outcome of unit j when exposed to a given level $w \in W$ of exposure, in which the set W represents the domain of the exposure. The fundamental problem, which is often known as fundamental problem of causal inference, is that the potential outcome $Y_j(w)$ is missing for all w not equal to W_j . Because we cannot directly estimate $Y_j(w)$ because we observe only $Y_j(W_j)$, we have to shift our focus to estimating the population exposure-response curve⁷¹ $R(w) = E[Y_j(w)]$. In this study, we estimate ERC by adopting the novel approach outlined by Cork et al,⁸⁹ which introduces a nonparametric doubly robust estimator utilizing pseudo-outcomes. The algorithm involves 3 key steps: (1) first, it fits a linear Generalized Propensity Score model¹⁻³ to compute covariate balancing weights, which help mitigate confounding biases; (2) second, it applies Generalized Additive Models^{4,5} with a quasi-Poisson likelihood to model the outcome variable while incorporating balancing weights; (3) third, it yields nonparametric doubly robust estimates of the ERC, integrating both the results of the Generalized Propensity Score and the ones of the outcome model. Note that the algorithm allows researchers to identify covariates that are likely to affect either the exposure variable, the outcome variable, or both (see [Appendix B in Supplemental Materials](#) for extended discussion on the model and on the covariates included in the 2 models).

Results

Sample descriptive statistics for women who underwent conservative ($n = 236$) and reconstructive ($n = 246$) surgery are

presented in Table 1. Results of the IRT models suggest that the GRM implemented accurately predict both latent traits measuring the satisfaction with preoperative information provided by the surgeon and the overall postsurgery breast satisfaction (see Appendix A, Appendix Tables 3-6 in Supplemental Materials for extended results). The estimated coefficients are statistically significant, with all items making strong contributions to the estimation of latent traits. Furthermore, statistical tests and model evaluation metrics confirm that the models have a good overall fit to the data, accurately capturing and predicting the latent traits. Moreover, findings reveal a strong positive association between these 2 estimated latent traits (Fig. 1): patients reporting more detailed and clearer information before surgery tend to report higher breast satisfaction. This holds for both patients facing conservative surgery (red dots) and those undergoing reconstructive surgery (blue dots). This positive correlation provides preliminary evidence that preoperative communication plays a role in shaping patient perceptions and postsurgical experiences, and it points to the need for deeper examination of a potential cause-and-effect relationship between the 2 dimensions.

Figure 2 reports the ERC curve estimated in the full sample (both conservative and reconstructive patients): the estimated ERC is shown in black, with its corresponding 95% confidence interval represented in orange (lower limit) and a red (upper limit). The estimated ERC demonstrates a clear positive cause-and-effect relationship between the satisfaction with preoperative information and overall postsurgery breast satisfaction.

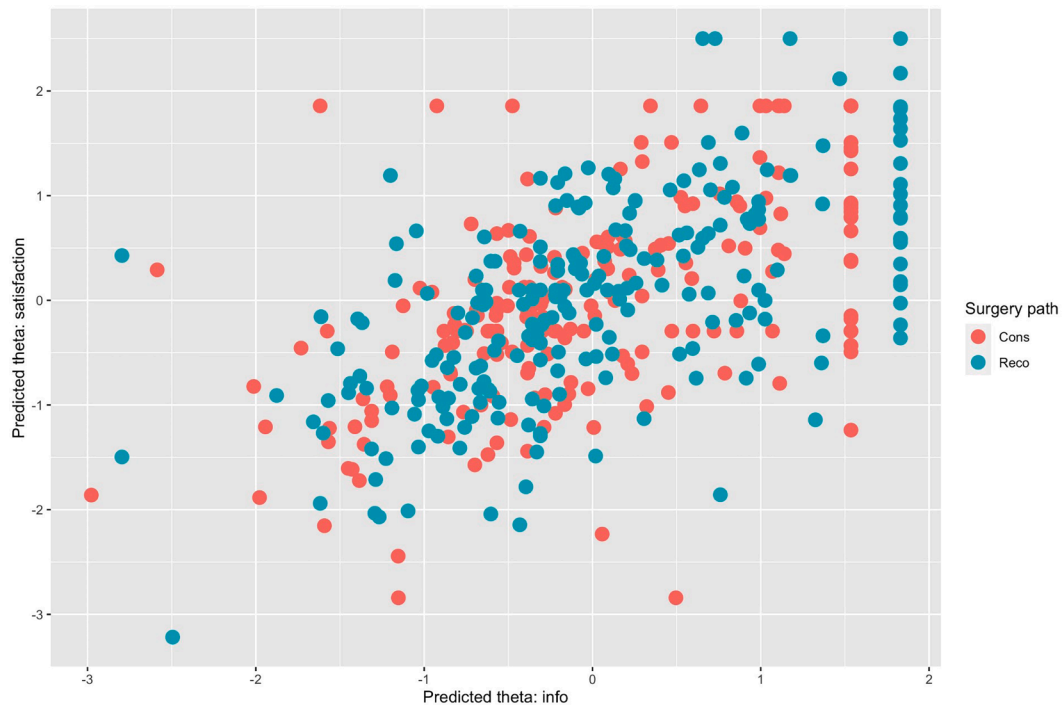
Specifically, the analysis shows that as the satisfaction with preoperative communication improves, there is a corresponding increase in patient-reported satisfaction with their surgical outcomes. This relationship is particularly well defined in the central part of the exposure domain, representing moderate levels of perceived quality of information. In this range, the ERC estimates are highly precise, clearly indicating that even moderate improvements in the preoperative information can result in notable gains in postsurgical satisfaction.

Figure 3 presents the ERC estimated separately for patients undergoing conservative surgery (left side) and those undergoing reconstructive surgery (right side). The main finding is a strong, positive cause-and-effect relationship between preoperative information and postoperative satisfaction, which remains consistent for both surgical paths. This suggests that, regardless of whether patients undergo conservative or reconstructive surgery, the satisfaction with information they receive before the procedure plays a crucial role in shaping their postoperative satisfaction. The ERC curves confirm that patients who are better informed preoperatively tend to report higher satisfaction with their postsurgery outcomes. In both surgical groups, the estimates are particularly accurate in the central part of the exposure domain, indicating that at moderate levels of communication satisfaction, predictions of the effect of improved satisfaction of information on postsurgical satisfaction are most reliable. However, there are some notable differences between the 2 groups. First, in the conservative surgery sample, the ERC curve shows less accuracy at the lower tail of the exposure distribution,

Table 1. Descriptive statistics and variable definition: Reconstructive vs conservative surgery path.

Variable	Definition	Conservative mean (SD)	Reconstructive mean (SD)	P value
N		236	246	
Age		57.84 (11.36)	53.18 (9.80)	<.001
University	Graduated from university	0.32 (0.47)	0.27 (0.45)	.275
Employed	Currently employed	0.50 (0.50)	0.63 (0.48)	.007
Comorbidities	Having at least one comorbidity	0.68 (0.47)	0.77 (0.42)	.020
live_alone	Living alone	0.15 (0.36)	0.13 (0.33)	.478
good_health	Reported being in a good health status	0.74 (0.44)	0.60 (0.49)	.001
follow_second_opinion	Followed the advice provided in a second opinion	0.21 (0.41)	0.22 (0.41)	.751
info_internet	Searched the Internet for information about her specific diagnosis	0.50 (0.51)	0.32 (0.47)	<.001
BMI		25.24 (4.41)	23.91 (3.95)	.001
Smoke		0.14 (0.34)	0.17 (0.37)	.342
Menopause		0.69 (0.46)	0.53 (0.50)	<.001
Sport	Practice any sport	0.64 (0.48)	0.61 (0.49)	.560
supported_care	Did not identify any phase in the care journey during which she felt inadequately supported	0.63 (0.48)	0.65 (0.48)	.664
involved_in_decisions	Reported sufficiently involved in decision making throughout the care journey	0.59 (0.49)	0.59 (0.49)	.920
sufficient_coordination	Reported low coordination among professionals	0.61 (0.49)	0.59 (0.49)	.640
know_referral	Aware of the specific healthcare professional to address at each stage of the treatment	0.50 (0.50)	0.54 (0.50)	.371
first_surgery	First surgery for breast cancer	0.94 (0.24)	0.85 (0.36)	.001

Figure 1. Joint distribution of predicted thetas: the x-axis represents the predicted quality of preoperative information, the y-axis represents the predicted postsurgery satisfaction. Colors refer to the class of breast cancer surgeries (reconstructive or conservative).



meaning that for patients who received low-quality preoperative information, the relationship between communication and satisfaction is more uncertain. Second, in the reconstructive surgery sample, the ERC is more concave and exhibits smaller confidence intervals, indicating more precise estimates. The concave shape

may reflect a nonlinear relationship in which small improvements in communication at low exposure levels yield substantial gains in satisfaction, whereas at higher exposure levels the slope (ie, effect strength) decreases. The narrower confidence intervals in the reconstructive surgery group imply that the findings are

Figure 2. Estimated ERC (black points), with 95% confidence interval.

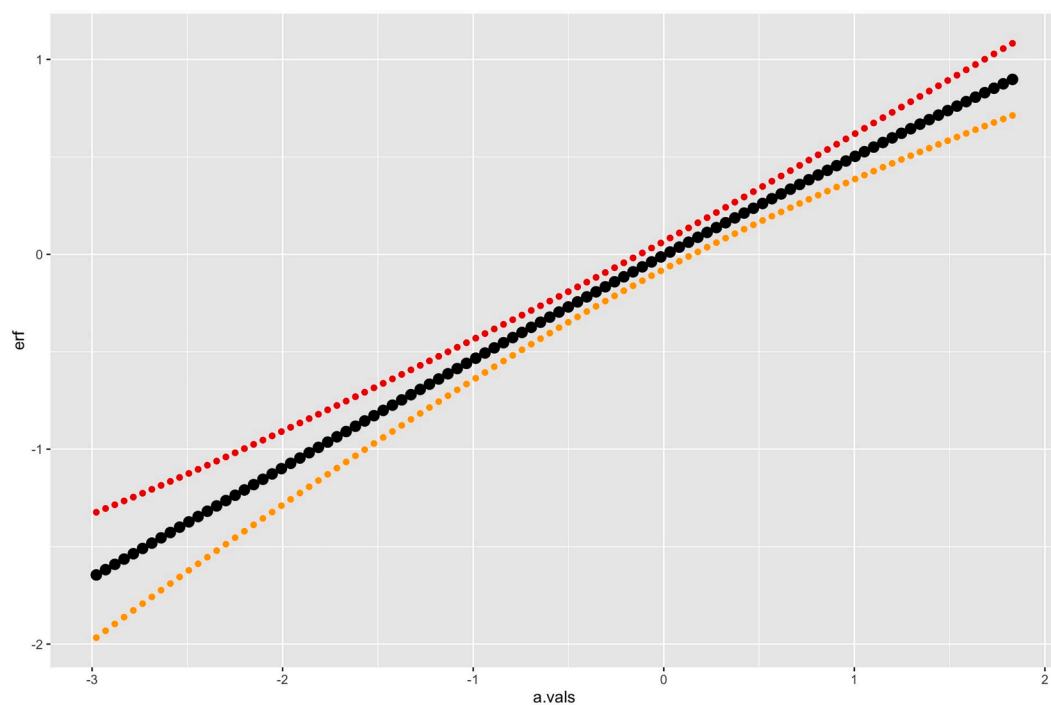
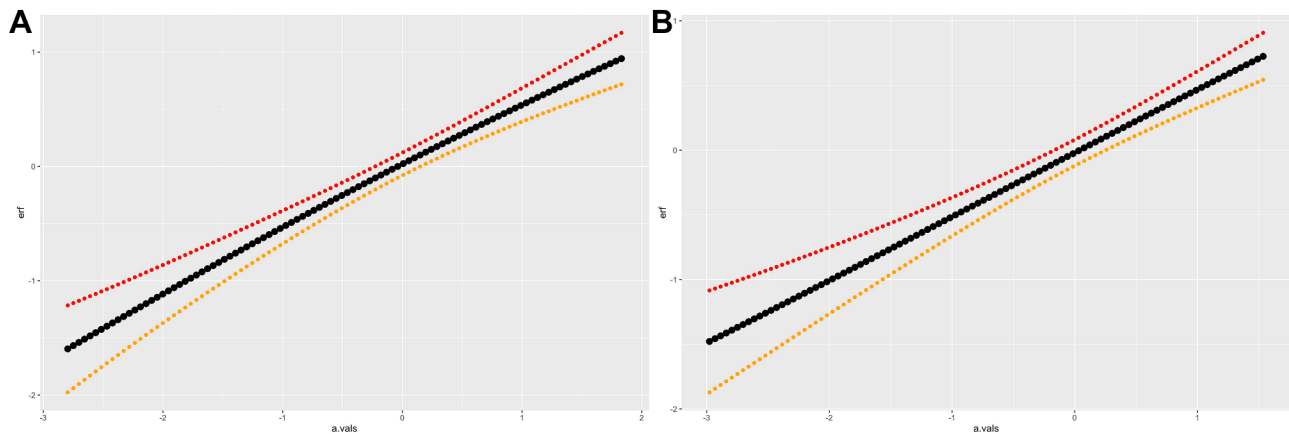


Figure 3. Estimated ERC (black points), with 95% confidence interval. (A) Conservative surgery. (B) Reconstructive surgery.



more robust and less influenced by external factors, which have not been captured through the covariates included in the model.

Discussion

In recent years, there has been growing interest in examining the doctor-patient relationship, particularly its shift toward a patient-centered approach that emphasizes a more collaborative partnership between doctor and patient. In this context, this study investigates the doctor-patient relationship in terms of communication between breast surgeons and patients undergoing breast surgery, with a focus on how preoperative information influences postoperative patient-reported outcomes. To address this question, the study applies a rigorous methodological approach, integrating IRT and ERC estimation on data including PROMs. This design enables a robust assessment of the causal impact of the health professionals' communication on patients' postoperative satisfaction with breasts. Consistent with previous research, this study confirms that patients who feel adequately informed are more likely to report higher levels of postoperative satisfaction.^{27,40} Nonetheless, it also extends existing knowledge by providing evidence for a causal relationship between patients' satisfaction with preoperative communication with the breast surgeon and their reported postoperative satisfaction with breasts. To our knowledge, the study is the first contribution that assesses the causal effect of the level of satisfaction with the information received preoperatively on patient-reported outcomes in the context of breast surgery using PROMs data in an observational setting. Previous research has often focused on the general impact of communication on patient satisfaction but has not analyzed the specific causal links using PROMs data related to breast cancer patients. In particular, in this study, IRTs are preliminarily used to elicit the patients' overall level of satisfaction with presurgery information and postsurgery breast satisfaction and, at a second stage, ERCs are used on the predicted traits to assess the causal effect of interest. Exposure-response curves have gained increasing interest in health economics and epidemiology literature as a tool for quantifying the effects of continuous exposures—such as environmental pathogens—on health outcomes. Recent studies have particularly emphasized the application of ERCs in evaluating the relationship between air pollution and various health indicators, including mortality, as well as the occurrence of cardiovascular and respiratory diseases.⁹⁰⁻⁹² Similarly, IRTs are widely used in health

research for modeling latent health traits, such as disease severity or patient-reported outcomes.⁹³⁻⁹⁶ Using PROMs survey data, our study represents the first attempt to extend the application of ERCs beyond traditional environmental or pathogenic exposures by focusing on a qualitatively different, patient-centered, domain, in which the exposure represents the patients' satisfaction with the information received by the surgeon, and the health outcome of interest is the reported satisfaction with breasts after surgery. This integration of IRT and ERC offers a novel methodological contribution, enabling the estimation of dose-dependent effects on latent health traits using survey data. However, the study has limitations. First, data were collected from a single clinical center, the University Hospital of Pisa. Although this hospital received official certification from the European Society of Breast Cancer Specialists⁹⁷ and is recognized as a center of excellence that provides comprehensive support to patients both physiologically and psychologically throughout their care journey, the findings may not fully generalize to other settings. In addition, the specialized nature and high standard of care that characterizes this institution could influence patient experiences and outcomes, potentially limiting the applicability of the results to hospitals with different levels of resources or care protocols. Second, the study evaluates patient outcomes in a relatively short time frame, with patient satisfaction with breasts being observed 3 months after surgery. Although this provides valuable initial insights, it does not capture long-term outcomes or changes in patient satisfaction over time. Future research should incorporate extended follow-up periods, including additional assessments at later intervals—ideally at 12 and 18 months after operation—to more comprehensively evaluate the overall impact of preoperative communication on patient well-being, particularly considering the potential evolution of breast appearance over time. It is therefore pertinent to examine the extent to which such changes are effectively communicated to patients, as well as whether this information is adequately understood and retained, especially during a period when patients' attention is understandably focused on the immediate cancer treatment.

Conclusions

Healthcare is increasingly conceptualized as a collaborative process in which patients and providers engage as partners in care management. Within this framework, this study contributes

to the patient-centered care literature by examining the relationship between information and communication exchange among surgeon and patient on patient-reported outcomes. More precisely, the study demonstrated the applicability of advanced causal inference methodologies within observational studies to demonstrate a causal relationship between satisfaction with information provided before surgery and patient's perceived satisfaction with the breast surgery. Nevertheless, in routine clinical practice, the benefit of doctor-patient communication is often overlooked because of recurring barriers. These often include limited interpersonal skills among health professionals, the propensity to reduce clinic time in favor of extended operating time, cultural differences, patient' heightened vulnerability when facing life-threatening illnesses such as cancer, as well as potential language barriers.^{21,39,98-100} In this context, the study findings add to the evidence on the importance of developing strategies that promote patient-centered care, such as the implementation of continuous training programs to enhance physicians' interpersonal and communication skills, the creation of clinical environments that actively support effective 2-way communication between health professionals and patients (or caregivers), and the adoption of supportive instruments. These instruments, such as Patient Decision Aids, help patients make informed choices that reflect their personal values and preferences, thereby enhancing not only the decision-making process but also overall satisfaction and quality of care.¹⁰¹ Furthermore, findings from this study increase the awareness of importance for systematically collecting and reporting patients' voices to ensure that their experiences and perspectives are effectively integrated into healthcare processes.^{102,103} Patient engagement is, in fact, essential to designing services that reflect real-life needs and expectations, thereby improving appropriateness and effectiveness. In conclusion, within an increasingly complex healthcare landscape characterized by persistent challenges, this study underscores the imperative of prioritizing patient-physician relationships within health systems. Additionally, the proposed approach, integrating IRT models with ERC estimation, sets a methodological precedent for future empirical research analyzing survey-based outcome data.

Author Disclosures

Author disclosure forms can be accessed below in the [Supplemental Material](#) section.

Supplemental Material

Supplementary data associated with this article can be found in the online version at <https://doi.org/10.1016/j.jval.2025.12.003>.

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