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# Patient Satisfaction and Ultrasound Use During Pregnancy

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## Abstract

Use, number, and frequency of ultrasounds women receive during pregnancy vary widely in practice. Current evidence suggests that women presenting with pregnancy complications benefit from additional ultrasounds, although excessive ultrasound use in low risk pregnancies may be unnecessary, costly and potentially harmful. However, evidence also finds that the use of ultrasound technology is associated with mothers' feelings of security and satisfaction with care; health care organizations are incentivized to promote these feelings of patient satisfaction, especially when clinical risk is considered low. Here, we examine the impact of ultrasound use on satisfaction during pregnancy among women in the Northeast who have recently given birth through an online retrospective survey. Contrary to expectations, findings suggest that ultrasound use is not a significant driver of satisfaction with pregnancy-related care. Efforts to enhance patient satisfaction during pregnancy using ultrasounds may increase resource use and cost, but do little to enhance patient experience overall.

**Keywords:** Ultrasound; Patient satisfaction; Health policy

## Introduction

Technology has long contributed to higher quality of care in the US health care system [1]. Yet, not all technology adds to health care quality equally, and many have argued that the introduction of new technology should be based on measures of both quality added and cost-effectiveness [2,3]. Quality is also multi-dimensional and includes measures of clinical as well as patient-focused quality outcomes. Patient satisfaction is one common component of health care quality measurement [4]. Health care providers, insurers and policy makers are interested in how satisfied patients are, as the perceived satisfaction of patients allows for improvements in the delivery of care.

One aspect of patient satisfaction centers on technology. Evidence has supported improved patient satisfaction with improvements in diagnostic technology and treatments in a number of areas including IV treatments, knee replacement, pain management, and surgical improvements [5-9].

Obstetric care is also a specialty where technologies such as sonograms and ultrasounds are common practice. Ultrasounds specifically are recommended for use at pregnancy onset to indicate the term of the pregnancy and to avoid the complications of post term pregnancy [10]. Ultrasounds generate high frequency and low intensity sound waves that pass through the abdomen and cervix to produce an image of the fetus. This technology has been used for over 50 years during pregnancies in the United States and around the world [11]. Ultrasound technology more recently has allowed for clear 3-and 4D imaging of the fetus. According to the American Pregnancy Association, there is no recommended number of ultrasounds a woman should receive [12].

Ultrasounds are a recommended part of the preventative prenatal care process for mothers when used appropriately. For most women, the ultrasound is the only visual contact they will have with their child throughout their entire pregnancy. As such, pregnant mothers have expressed wanting the ultrasound to be accurate [13]. Others report that after the ultrasound takes place, they become much more connected with their unborn baby [11]. This reduction in anxiety, and increased bonding experience increases the positive perception of the ultrasound [14]. Ultrasounds are not, however, without risks. Limited evidence suggests that there are psychological impacts on pregnant women before, during and after an ultrasound procedure that are

linked to increased anxiety, attachment, stress, and changing attitudes towards the pregnancy [15].

More general evidence of the risks associated with excessive technology use on the patient also remains mixed. A report in 2010 by the Office of the Inspector General found that there were geographic instances of ultrasound "overuse", but defined overuse primarily in terms of cost to insurers and patients, and not in clinical terms [16]. Therefore the link between use of ultrasound technology and satisfaction with the pregnancy and birthing experience remains unclear [15,17] and studies on the safety of its use are generally considered lacking. Further, the Canadian Society of Obstetrics and Gynecology specifically states that ultrasounds are not recommended and should not be used: "to have a picture of the baby, solely for non-medical reasons, to learn the sex of the baby, solely for non-medical reasons, or for commercial use, such as trade shows or making videos of a baby" [18]. No such guidelines exist in the U.S., although the FDA does suggest in consumer material that ultrasounds should not be used to create keepsake videos [19].

Thus, while the evidence on the clinical impacts of ultrasound utilization remains mixed, what is of interest is how the technology impacts the satisfaction of the patient and the resulting promotion of its use by health care providers and organizations who seek to enhance that satisfaction.

Measures of patient satisfaction as a component of health care quality are becoming increasingly important as the health system begins utilizing value-based purchasing reimbursement mechanisms. Founded under the Affordable Care Act of 2011, and begun under Medicare in mid 2013, value based purchasing is a method of differentially reimbursing providers across thirteen quality of care domains, one of them being the patient's experience with care [20]. Understanding patient satisfaction across a number of services will

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therefore be increasingly more important to health care organizations, specifically Accountable Care Organizations (ACOs) that are designed to take advantage of these quality payments, especially as many private payers will also adopt the Medicare measurement and payment standards in the near future.

Given that technology is so consistently tied to patient satisfaction, the question arises as to whether providers and organizations might utilize it more frequently, especially when the perceived risk is considered low. This leads to the natural question of whether or not a higher number of ultrasounds are tied to patient satisfaction. It is also important to consider what other factors might independently affect perceived patient satisfaction that might mitigate this relationship. Many pregnancies encounter complications, which can result in high levels of stress and independently impact the mother's perceived satisfaction with care [21]. Research has also shown that individuals who have a positive self-perceived health status will have a positive perception of satisfaction with the medical care provided [13,22]. In addition, patient satisfaction has been found to vary based on socio-economic and socio-demographic factors such as income, age, race, and education [23].

To answer these questions we examine the health care experiences of women along the domains of patient satisfaction to assess the relative impact of ultrasound use on overall care satisfaction, controlling for the presence of complications and socioeconomic and demographic factors. Given previous literature, we hypothesize that increased ultrasound use will lead to greater levels of care satisfaction, but that the presence of complications during pregnancy will mitigate the strength of that relationship.

## Materials and Methods

The sampling frame used for this study were women 18 years of age or older who had given birth to a child in the past year (between 10/2011 and 03/2012) in the Northeast United States.

Individuals were recruited to participate in an online survey through snowball sampling using Facebook and word-of-mouth recruitment. Facebook has been identified as a low cost survey tool that allows for enhanced targeting of distinct sample populations, however due to its self-selecting nature, findings are usually not generalizable beyond the target group [24]. This poses less of a problem for an exploratory study.

A Facebook group was formed in order to have a central location on Facebook that would allow women to gain access to the survey. This Facebook group further allowed individuals on Facebook to invite women they knew who had a child at home who was under 12 months of age.

Because Facebook utilizes a rolling screen (rolling posts), regular status updates were created and deployed every few days to ensure visibility of the study to promote recruitment. These updates contained the link to the survey. The Facebook project page status update stated the criteria of who could participate. A second recruitment strategy was to target mother's groups on Facebook. Public mothers groups were identified using the Facebook search tool and a post was added to the Facebook wall of multiple mother's groups containing a brief summary of where the study originated, who was gathering the data, who was eligible to participate, and the link to the survey. This allowed all mothers who are members of the group to see the Facebook post and participate in the study if eligible. These posts were added to the walls of mother's groups at least once a week.

All participants viewed an informed consent page prior to agreeing to participate. The University of New Hampshire Institutional Review Board for the protection of human subjects approved all study protocols.

## Survey tool

An online survey tool was utilized, hosted by the University of New Hampshire Survey Center via Survey Cat. The survey was divided into three primary sections: (1) overall care experiences, (2) mothers' satisfaction with their pregnancy care, and (3) demographic information.

## Measures

Satisfaction measures were drawn from the Patient Satisfaction Questionnaire, PSQ-18 scale [25]. A series of 18 questions are asked in the PSQ-18 scale. In this study, 16 of the 18 original questions were used, as two questions were not applicable to prenatal care. Questions were grouped together according to each of the seven different measures of satisfaction; general satisfaction, technical quality, interpersonal manner, communication, financial aspects, time spent with doctor, and accessibility and convenience. All questions were asked using the Likert scale. General satisfaction was comprised of two questions stating; "the medical care I have been receiving is just about perfect" and "I am dissatisfied with some things about the medical care I receive". Four of the questions were related to the technical quality scale but only three were used in this questionnaire. These questions stated; "I think my doctor's office has everything needed to provide complete medical care", "when I go for medical care, they are careful to check everything when treating and examining me", and "I have some doubts about the ability of doctors who treat me". The interpersonal manner scale had two questions that stated; "doctors act too businesslike and impersonal toward me" and "my doctors treat me in a very friendly and courteous manner." Communication has two questions as part of the scale stating; "doctors are good about explaining the reason for medical tests" and "doctors sometimes ignore what I tell them". The financial aspects scale consists of two questions stating; "I feel confident that I can get the medical care I need without being set back financially" and "I have to pay for more of my medical care than I can afford". There are two questions in the time spent with doctor scale asking; "those who provide my medical care sometimes hurry too much when they treat me" and "doctors usually spend plenty of time with me". The last scale that makes up the PSQ-18 satisfaction survey is the accessibility and convenience scale. This scale has three questions but only three were used in this survey. These questions stated; "I have easy access to the medical specialists I need", "I find it hard to get an appointment for medical care right away", and "I am able to get medical care whenever I need it."

In order to confirm the internal reliability of these scales, Chronbach Alpha's were run on each scale prior to analysis. The Cronbach Alpha results were as follows: general satisfaction .589, technical quality .507, interpersonal manner .478, communication .271, financially .672, time spent with doctor .755, and accessibility and convenience .537. Only the value for communication fell below the recommended values previously associated with the tool [15].

Prior to analysis of the data, each of the variables was coded so that higher scores reflected greater satisfaction. For each scale, the item scores were averaged. As previous research has found (cite), women reported overall high levels of satisfaction (mention skew and perhaps give an example of one of the scales). The summary measures were

dichotomized at the top quartile to compare those highly satisfied with other women, as is suggested when performing such analysis on satisfaction data [6].

The number of ultrasounds was determined from an open-ended question in the survey asking, “how many ultrasounds did you have during your pregnancy?” A minimum of 1 and maximum of 40 ultrasounds were reported. Because of severe positive skew (4.35), non-parametric tests are used to examine ultrasound utilization. The median number of ultrasounds was 4.00.

Sociodemographic and pregnancy control variables included age, race/ethnicity, marital status, educational attainment, employment status, type of health insurance and pregnancy complications. Age is measured in years, with a minimum age of 19 and a maximum of 40. Race/ethnicity is categorized as white or other; the other category includes women who identified as American Indian or Alaska Native, Asian or Asian American, and Hispanic or Latino. Marital status is categorized as married or other; the other category includes women who identified as divorced, never married, or as a member of an unmarried couple. Educational attainment is measured as less than college graduate, college graduate, or advanced degree. Employment is measured as employed or other; women who identified as employed for wages or self-employed are categorized as employed while women who identified as homemakers, students, or out of work were categorized as other. Type of health insurance was categorized as private insurance or other; women who were identified their insurance coverage as Healthy Kids, self-paid and Medicaid were categorized as other. Pregnancy complication is a dichotomous

### Analysis plan

All analyses were conducted in SPSS version 21. Percentages were

calculated to describe the sample population. Bivariate analyses, included t-test and chi square tests, were calculated to examine the relationship of demographic factors and satisfaction. Bivariate tests could not be conducted on race/ethnicity, marital status and health insurance type because of small group sizes. Non-parametric, Wilcoxon-Mann-Whitney and Kruskal-Wallis, tests were used to examine the ultrasound use by satisfaction and pregnancy complications. Multivariate analyses used logistic regression to examine the impact of the ultrasound use and presence of complications on the domains of satisfaction.

### Results

A total of 195 participants participated in the survey; sixty-two were dropped due to missing data or because they did not fit the study criteria. The analytic sample contains 133 women, whose characteristics are shown in Table 1. The majority of respondents were white and married with an average age of 28.6. The majority of participants had graduated from college (70.7%) and nearly 30% had earned advanced degrees. In addition, approximately 70% of women were employed and 91% had private health insurance.

Table 1 also shows the percentage of women who reported that they were very satisfied with their care by the domains of satisfaction. Nearly 40% of women reported that they were highly satisfied with the time they spent with their doctor, while nearly 59% reported they were satisfied with their provider’s interpersonal manner. There were few significant differences in satisfaction by sociodemographic and pregnancy factors. General satisfaction and satisfaction with time spent with the doctor differed by age; older women were more likely to report being highly satisfied than were younger women both generally ( $p < .05$ ) and with the time spent with the doctor ( $p < .05$ ). Satisfaction with the financial aspects of care differed by educational attainment; women

	Highly Satisfied							
	Total	General Satisfac-tion	Technical Quality	Interpersonal Manner	Communication	Financial Aspects	Time Spent with Doctor	Accessibility & Convenience
<b>Total</b>	<b>28.58 (4.25)</b>	<b>40.6</b>	<b>49.6</b>	<b>58.6</b>	<b>55.6</b>	<b>57.1</b>	<b>39.1</b>	<b>52.6</b>
<b>Age</b>								
Satisfied		27.92 (4.32)*	28.54 (4.28)	28.02 (4.47)	28.37 (4.25)	28.51 (4.57)	27.85 (3.99)*	28.60 (4.17)
Highly Satisfied		29.54 (3.98)	28.62 (4.25)	28.97 (4.06)	28.74 (4.26)	28.63 (4.01)	29.71 (4.41)	28.56 (4.34)
<b>Race/Ethnicity</b>								
White	97.0	41.1	49.6	58.9	55.8	57.4	40.3	51.9
Other (1)	3.0	25.0	50.0	50.0	50.0	50.0	0.0	75.0
<b>Marital Status</b>								
Married	89.5	39.5	50.4	58.0	54.6	58.0	39.5	49.6
Not Married (1)	10.5	50.0	42.9	64.3	64.3	50.0	35.7	78.6
<b>Education</b>								
Less than College Graduate	29.3	33.3	43.6	59.0	66.7	38.5**	33.3	53.8
College Graduate	42.1	46.4	55.4	60.7	55.4	69.6	48.2	51.8
Advanced Degree	28.6	39.5	47.4	55.3	44.7	57.9	31.6	52.6
<b>Employment</b>								
Employed	69.2	43.5	52.2	58.7	54.3	56.5	40.2	53.3
Not Employed	30.8	34.1	43.9	58.5	58.5	58.5	36.6	51.2
<b>Type of Health Insurance</b>								
Private Insurance	91.0	41.3	48.8	59.5	55.4	57.9	40.5	51.2
Other (1)	9.0	33.3	58.3	50.0	58.3	50.0	25.0	66.7
<b>Pregnancy Complication</b>								
No	54.9	42.5	54.8	63.0	58.9	57.5	41.1	56.2
Yes	45.1	38.3	43.3	53.3	51.7	56.7	36.7	48.3

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

(1) These categories contain fewer than 20 respondents; percentages should be interpreted with caution. Chi square tests were not run for these variables

**Table 1:** Satisfaction with Health Care by Women’s Characteristics (n=133).

with higher education were more satisfied with their care ( $p < .01$ ). There were no significant differences in satisfaction by employment status.

The average respondent had 4 ultrasounds (data not shown). Non-parametric tests were used to determine whether the number of ultrasounds varied by age, education, or employment. No significant associations were found (data not shown). Unsurprisingly, women who had complications received more ultrasounds than did their counterparts who had no complications (4.5 vs. 3.0 respectively,  $p < .001$ ; data not shown). Despite differences in the number of ultrasounds, women who had pregnancy complications were no more or less satisfied with their care than were other women (Table 1).

Table 2 shows the median number of ultrasounds by satisfaction domains. Contrary to previous literature on technology use and satisfaction, there were no significant differences in satisfaction by the number of ultrasounds women reported having. These findings were confirmed for general satisfaction and technical quality via logistic regression analyses controlling for pregnancy complications.

## Discussion

Although research has shown that higher technology use may lead to increased patient satisfaction, this analysis suggests differently for this type of technology and patient. Here we show that the number of ultrasounds a woman receives during her prenatal care does not significantly impact her perceived satisfaction across a number of satisfaction domains.

There are many potential reasons for this finding. One possibility is the perception of women towards the technology. Ultrasounds have become a common procedure during pregnancy. More recently, some companies have begun offering ultrasounds for home use, most commonly in what are being called ultrasound parties, or gender reveal parties [26]. While this a relatively new phenomenon, its popularity is increasing, showing the casual nature of women's perception towards ultrasounds as common practice, low risk, and readily available, even though such practices are not recommended [18,19].

Second, because pregnancy care is multifaceted and presented as a suite of services, it may be difficult for women to distinguish one aspect of the care they receive in relation to the others.

A third would be due to sampling limitations. This response group was educated, more likely to be insured, and white. It is unclear how these might have impacted satisfaction independently. Prior research has shown that women deemed high risk due to age or complicated status tend to experience higher levels of anxiety during pregnancy [27,28]. Research has demonstrated that utilization of medical care is positively related to income, and that technology innovation and use is driven by consumer demand [29]. Higher education has also been

linked to higher care satisfaction [30]. Given this would suggest that this analysis may overestimate the utilization of ultrasounds relative to lower income, lesser educated or lesser-insured pregnant women. Yet here we found no relationship between interpersonal care satisfaction and education or insurance.

The implications for these findings are primarily important for health care organizations, especially those who are entering into risk seeking arrangements under the provisions in the Affordable Care Act, which uses patient satisfaction as a component of measurable quality. According to the law, the reimbursement providers receive will be prospective and based on developed quality metrics in addition to the perceived satisfaction delivered to the patient for certain procedures rather than on a fee-for-service basis [9]. This may prompt the belief that increased ultrasound use may lead to increased satisfaction with care, resulting in the tendency to provide more ultrasounds, especially where clinical guidelines are not explicit as to overuse, and where evidence is mixed on increased use. Yet, even in the absence of clinical impact data, increasing the number of ultrasounds would lead to higher costs and resource use [11]. In a review of ultrasound costs charges under fee for service reimbursement, ultrasound costs ranged from \$330 to \$1,555 for an insured patient with an HMO plan under the Northeast region's largest insurer, Harvard Pilgrim Health Care, and ranged from \$295 and \$1,703 for uninsured patients [31]. This is the region where the survey respondents originated. While it is unclear what the actual cost would be to the health care organization under a capitated or quality enhanced payment model, these ranges suggest that aggregated use costs could be substantial if the organization were to participate under an Accountable Care Organization (ACO).

ACO's attempt to achieve a vision of efficient and effective care that is patient centered, or optimal from the patient's perspective, and thus must be convenient and reliable in addition to being clinically effective [32]. This places the added burden on the health care organization or system to create processes of care that are engaging and meaningful to patients but that also are evidence based, efficient, and affordable.<sup>2</sup> Thus, patient satisfaction matters greatly, so long as the care process remains efficient. Enhancing satisfaction at the expense of clinical quality at added cost would be counterproductive.

This analysis further shows that women who experience complications during their pregnancy receive a significantly higher number of ultrasounds than women that do not experience complications. Such increased ultrasound use is often called for when the pregnancy is determined high risk [7]. However, even in pregnancies with complications, increased ultrasound use was not associated with changes in satisfaction. This would seem to suggest that evidence found by Goerbna-Tricas and others on the drivers of maternity care satisfaction might be multi-dimensional and interdependent, but not driven by one aspect of technology, such as ultrasounds.

## Limitations and Future Research

This study recruited through Facebook. While Facebook is a multi-national social medial platform, it is not open access, meaning that recognition has to occur through referral. Because this study emanated in the Northeast, women tended to be from a small geographic area, highly educated and privately insured. However, as mentioned, this group is of interest as care volume tends to be higher is privately insured patients. All data was also gathered on a retrospective basis and there is the potential for recall error. Further, because participants were self-selected, this could introduce bias as those with stronger opinions on a subject may be more likely to participate.

	Median Number of Ultrasounds	
	Satisfied	Highly Satisfied
General Satisfaction	4.0	3.0
Technical Quality	4.0	3.0
Interpersonal Manner	4.0	3.5
Communication	4.0	3.5
Financial Aspects	3.0	4.0
Time Spent with Doctor	4.0	3.0
Accessibility and Convenience	3.0	4.0

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

**Table 2:** Median Number of Ultrasounds by Satisfaction with Health Care (n=133).

For future research, diversifying the sampling frame could result in a more diverse response rate in regards to the descriptive data that was collected. Further, it is unclear if the use of technology is similarly unrelated to satisfaction in patients with other disorders, especially technologically intensive ones. In addition, the role of technology in patient care is often important and warranted. Only in cases where its effectiveness is unclear should the link between use and satisfaction be of interest.

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