

ARTIGO ORIGINAL

PATIENT SATISFACTION OF A HOME DIAGNOSTIC IMAGING SERVICE: A CROSS SECTIONAL STUDY

*SATISFAÇÃO DOS PACIENTES COM UM SERVIÇO DE DIAGNÓSTICO POR IMAGEM DOMICILIAR: UM ESTUDO TRANSVERSAL*Lorena Jorge Lorenzi¹Giovana Fondato Costa²Helianthe Kort³Paula Costa Castro⁴

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Resumo

O estudo teve como objetivo identificar a satisfação dos pacientes frente à prestação de um serviço de diagnóstico por imagem domiciliar no Brasil. Este estudo observacional e transversal combina abordagens quantitativas e qualitativas. Foram analisados dados de uma pesquisa online de satisfação realizada por uma empresa que realiza diagnósticos por imagem domiciliares, principalmente para pessoas idosas. Foram examinadas respostas de satisfação dos pacientes de fevereiro de 2022 a junho de 2023, sobre seis aspectos: agendamento, tempo de resposta, cordialidade dos profissionais, atenção e cuidado, higiene e vestimenta, e satisfação geral. Além disso, uma pergunta aberta reuniu observações dos pacientes. Foram realizadas análises descritivas e a análise de conteúdo de Bardin. Foram identificados 1.045 atendimentos e todas as métricas de satisfação receberam uma nota média superior a 9,6. As observações foram, em maioria, positivas e destacaram o cuidado oferecido pelos profissionais, especialmente o atendimento humanizado e profissionalismo durante o serviço. No entanto, alguns indivíduos relataram desafios, como atrasos no agendamento e dificuldades para responder à pesquisa. A alta satisfação com o serviço e as perspectivas dos pacientes destacam a importância desses serviços domiciliares, ampliando o acesso dos indivíduos a esses diagnósticos e promovendo maior equidade na saúde.

PALAVRAS-CHAVE

Serviços de Diagnóstico. Serviços de Saúde. Aceitação pelo Paciente de Cuidados de Saúde. Satisfação do Paciente.

Abstract

The study aimed to assess patient satisfaction with the provision of a home diagnostic imaging service in Brazil. This observational, cross-sectional study combines quantitative and qualitative approaches. Data were analyzed from an online satisfaction survey conducted by a company specializing in home diagnostic imaging, primarily for older adults. Patient satisfaction responses from February 2022 to June 2023 were examined across six aspects: scheduling, response time, staff courtesy, attention and care, hygiene and attire, and overall satisfaction. Additionally, an open-ended question gathered patient comments. Descriptive analyses and Bardin's content analysis were performed. A total of 1,045 consultations were identified, with all satisfaction metrics receiving an average score above 9.6. Most

comments were positive, highlighting the care provided by professionals, particularly humanized care and professionalism during the service. However, some patients reported challenges, such as scheduling delays and difficulties responding to the survey. The high satisfaction with the service and patient perspectives underscore the importance of home diagnostic services in expanding access to healthcare and promoting health equity.

KEYWORDS

Diagnostic Services. Health Services. Patient Acceptance of Health Care. Patient Satisfaction.

1 Introduction

Improving access to diagnostic exams for the early detection of health conditions can promote the identification of initial symptoms, ensuring care planning according to different existing intervention and treatment options, avoiding negative consequences that the emergence and the progression of these conditions can cause (Francis; Pandian; Anitha, 2022; Haataja, 2020).

According to Ford, Dore e Moullet (2021), imaging diagnostics, such as radiography, ultrasound, tomography and magnetic resonance imaging, can identify various health conditions, such as stroke, headache, coronary artery disease, chest pain, low back pain, among others. Additionally, equipment such as the electrocardiogram (ECG) and electroencephalogram (EEG) can generate essential graphical diagnostic data.

One way to expand access to diagnostic imaging exams is remote testing, where professionals perform exams at the patient's home and send the results via the internet for specialist analysis. This approach is particularly beneficial for older people, individuals living in isolated regions, and those with mobility difficulties, ensuring essential healthcare without the need for travel (Karako et al., 2020). This is especially important given the ongoing population aging in Brazil and worldwide.

Providing home health services can increase accessibility and quality of care. A review by Lizano-Díez et al., (2022) regarding home healthcare services, found that providing them at home had a positive impact on patient satisfaction and their quality of life, in addition to economic impacts, such as reducing health care costs. One strategy for this is the use of portable equipment, such as diagnostic imaging. Currently, studies confirm the accuracy of portable x-ray, ultrasound and magnetic resonance imaging (Elzeneini et al., 2022; Guallart-Naval et al., 2022; Odume et al., 2022).

However, home-based imaging diagnostics requires a dedicated and highly trained team, a greater number of professionals and a suitable domestic space to carry it out. Nevertheless, the overall service often results in lower costs, reduced risk of hospital infection, and improves patient experiences as well as increases access to this service (Dollard et al., 2022; Henderson et al., 2022).

Satisfaction with these services, which depends on the user's perception of performance of a product or service (Kotler, 2005), can influence the assessment of service quality, as well as affect patient trust, safety, loyalty and commitment (Durmuş; Akbolat, 2020; Kalaja, 2023). Therefore, evaluating satisfaction is essential for health care institutions to plan appropriate improvements since several factors can influence customer satisfaction with health services, such as pre-existing expectations, sociodemographic characteristics and experiences with the service (Kalaja, 2023).

In the context of this topic, while many studies exist in the scientific literature, most focus on the technical effectiveness of these mobile devices, or are specific to some diagnostic equipment, such as a portable x-ray, or identify a specific health condition, or make comparisons of the use of these equipments inside and outside the hospital environment (Canadian Agency For Drugs And Technologies In Health, 2016; Gualart-Naval et al., 2022; Khan et al., 2023). Furthermore, Toppenberg; Nielsen; Damsgaard (2022) evaluated user satisfaction with x-rays only. Thus, it is crucial to explore other home diagnostic imaging services and assess patient satisfaction beyond x-rays.

Therefore, verifying user satisfaction with mobile diagnostic imaging services is crucial for improving and developing these home-based services. This feedback provides essential information to the Unified Health System in Brazil (SUS), helping establish scientific guidelines and protocols for home diagnostic imaging services and benefiting sector companies. The objective of the present study was to identify patient satisfaction regarding the provision of an imaging diagnostic service at home in Brazil.

2 Methods

This is an observational, cross-sectional study, with a quantitative and qualitative approach. The company X is the object of study, which had a database of satisfaction surveys about services they carried out with patients from February 2022 to June 2023.

Company Characterization

Online and in-person interviews were conducted with managers of company X in order to characterize the company. It is located in Brazil, in São Paulo state, and has been providing home care services for over 25 years, serves more than 45 cities and carries out more than 100 services per day (Mobi Diagnostic, 2026). The company performs the following home-based diagnostic exams: ECG, Holter, Ambulatory Blood Pressure Monitoring (ABPM), Ultrasound, Echocardiogram, and Radiography. Appendix A presents the portable equipment used to perform the exams and the time to the diagnostic exam result to be available.

The professionals involved in providing the service include radiology technicians and operational staff, responsible for carrying out on-site exams, scheduling exams and logistics. Professionals who perform services at home use protective equipment, such as lead aprons, thyroid protectors, gloves and masks. In addition, the team uses a mobile tripod.

The transport of equipment and staff to the patients' homes is carried out by a Fiat Mobi car, with service covering individuals within a maximum radius of 200 kilometers. The average time to carry out each type of exam at the patient's home varies from 15 to 45 minutes. The average duration of the process, from the beginning of transportation to the execution of the exam, is two to three hours.

The quality of the exams is checked by sampling, and daily the quality manager selects exams carried out by the team and provides a score based on the quality of the exam. Except in special cases, the company has an approval rate of around 99% of the images generated by the exams, according to the doctor who analyzes the images.

According to the company, it serves mostly female individuals (62.4%), ranging from newborn babies to individuals aged 112 years. The distribution by age group indicates that approximately 2.8% of care is for newborn babies up to two years of age, 12.9% for adults aged 18 to 59, around 19% for older patients aged 60 years up to 79 years old, and more than half are for older people aged 80 to 99 years old (54.0%). The company also provides around 2.7% of services to individuals over 100 years of age. Furthermore, the company has most of its clients coming from health insurance plans and the rest 10.8% are private patients who directly contract the company's service.

Data Collection Procedures

To identify customer satisfaction with the service provided by X company, a database was analyzed with information already collected by the company, through an online form, from February 2022, when the form started, until June 2023.

Selection of Participants

The criteria for the inclusion of services provided by the company were to have customer responses to the satisfaction survey regarding the service carried out at home, and the survey to have been completed from February 2022 to June 2023. Responses with problematic or incorrect data, due to problems in the company's system, were excluded, such as incorrectly entered data, e.g. notes registered with values 10 that appeared with values 0.

Study Outcomes

The satisfaction survey was conducted by the company, and the authors had no prior contact regarding the development of the questionnaire or the execution of the data collection. All these steps were carried out by the company. For the present study, the database was provided by the company for the researchers to analyze the responses.

The survey contained 6 questions, which could be answered from 0 to 10, with 10 being the highest and best possible score, in addition, there was an open question about observations that customers would like to report about the service. This satisfaction survey was answered through the company's online system. The six closed questions were on the following topics: satisfaction with the scheduling sector; response time for service; professional cordiality; professional attention and care for the patient; professional hygiene and attire; general satisfaction about the service. The appendix B presents the satisfaction questionnaire developed by the company, including the closed-ended questions and the open-ended question.

Ethical Aspects

This study is part of a project in Brazil, called "Health2Home: Diagnostic imaging at home for older users" and was approved by the Ethics Committee of the Federal University of São Carlos, approval number 6.454.104.

Data Analysis

Quantitative data were recorded through descriptive analysis such as absolute and relative frequency, mean, standard deviation, median and quartiles. In relation to qualitative data, the observations written in the company's satisfaction survey were analyzed following the content analysis methodology (Bardin, 2011). Two of the authors analyzed all the responses and collaboratively grouped the information into content derived from the data, based on a coding tree developed by the authors, and the data was categorized according to the similarity of the content. A third author checked the data analysis and resolved any discrepancies.

Handling Bias in Data

To avoid bias in the data, problematic data has been removed, consisting of the exclusion of information contained in the company's database that had values with some irregularity. This data referred to the responses to the satisfaction survey, as there was a problem in the company's system and some patients were unable to record their satisfaction rating correctly. The data was excluded to prevent it from influencing the results. Since the questionnaire was developed and administered by the company, it was not previously validated and tested, steps that could have minimized these data collection biases and that should be carried out in future studies.

3 Results

To verify user satisfaction, 1,177 responses from the company's online survey were analyzed considering the period from February 2022 to June 2023. To avoid bias, in the data, 132 responses were excluded, as they presented errors during the recording of the answer in the online system used. In this way, 1,045 responses about services were included for analysis. Although the satisfaction questionnaire did not assess the age of the respondents, 75.7% of the company's clients are over 60 years old (56.7% over 80). Appendix C presents the descriptive analysis of the data, including minimum values, mean, median and standard deviation.

Among the 1,045 services analyzed, all satisfaction aspects had mean scores above 9.6 and the median, 1st and 3rd quartile were 10.0. However, the minimum score in some aspects was 1.0, being the lowest possible. Appendix D presents the absolute and relative frequencies for each service aspect. Satisfaction with scheduling and response time for service had scores of 1.0 (four and two, respectively) and 3.0 (3 and 2, respectively). Other satisfaction themes had a minimum score of 5.0, with over 91% of scores being 10.0.

Observations answered in the satisfaction survey

The satisfaction survey included an open observation about the service provided. Among the responses analyzed, 333 observations were identified, which had different data. A content analysis was performed to identify similarities and patterns in the data and group them into three categories: positive, with positive responses about the service provided; negatives, with negative responses and criticisms about the service provided; and the other categories, with answers that are not classified as positive or negative. These categories were divided into subcategories according to the characteristics, defined as follows:

Positive observation:

- General information about the service or the professionals: adjectives or general expressions about the service or the professionals (e.g. the service was great, very good, excellent).
- Speed and punctuality in the service: compliments about the speed or punctuality of professionals' services (e.g. speed, agility and punctuality).
- Professional aspects: information regarding aspects of professionalism of the professionals in the service (e.g. dedication, competence, experience, professionalism, skill, organization, training, qualification, responsibility, efficiency, preparation, practicality, ethics and hygiene).
- Humanized professional service: information about aspects of humanization in the care of the professionals (e.g.: kindness, affection, empathy, sympathy, being helpful, education, humanization, attention, cordiality, concern, delicacy, zeal, care, respect, calm and patience).

Negative observation:

- Time to schedule/perform the service: complaint about the delay in scheduling the service or executing the service (e.g. finding it taking a long time to perform the service since scheduling and the scheduling takes a long time).
- Company digital marketing: complaint about the company's digital marketing (e.g. suggesting that they make it easier to find the company on the internet).
- Service confirmation: complaint about the lack of confirmation before the service takes place (e.g. not getting in touch to confirm before referring the professional and not informing about the time the professionals would arrive at the home).
- Access to exam results: complaint about difficulty in patient access to the exam results (e.g. the family of the child who underwent the test did not have access to the results).
- Questionnaire/Survey problem: complaint about problems in the online satisfaction survey (e.g. when choosing a score of 10, the user only sees the 1, with the zero missing after the 1).

- Diagnostic equipment: complaint about the portable equipment used to carry out the diagnosis (e.g. finding the portable diagnostic equipment strange and large, taking up a lot of space).
- Complaints about the professionals who provided the service: complaint about the professional being slow, very perfectionist or about the lack of cordiality of the professionals who carried out the service at home (e.g. little cordiality at times and the professional who carried out the service was slow and very perfectionist).

Others:

- The survey question is not applicable: the question about scheduling does not apply due to the fact that the respondents did not make the appointment (e.g.: questions about scheduling do not apply, as it was carried out by the company contracting the service and not by the responding user).
- No complaints or comments about the service: respondents have no positive or negative comments (e.g. no complaints and a user entered the name of the daughter who received the service).
- Incomprehensible observation: the answer is incomprehensible (ex: "very atebcuo").

Therefore, 595 pieces of information were identified in the observations filled out by users, which generated the subcategories. Some observations had information from more than one subcategory. Table 4 presents the absolute and relative frequencies in which these subcategories were verified in the observations.

Table 1 | Frequency that each subcategory was identified in users' observations about services carried out by the company from February 2022 to June 2023

Category	Subcategory	Quantity	%
Positive Observation	General information about the service or the professionals	227	38.2
	Humanized professional service	243	40.8
	Professional aspects	66	11.1
	Speed and punctuality in service	32	5.4
Negative Observation	Time to schedule/perform the service	5	0.8
	Company digital marketing	1	0.2
	Service confirmation	2	0.3
	Access to exam results	1	0.2
	Questionnaire/Survey problem	4	0.7
	Diagnostic equipment	1	0.2
	Complaints about the professionals who provided the service	3	0.5
Others	The survey question is not applicable	5	0.8
	No complaints or comments about the service	3	0.5
	Incomprehensible observation	2	0.3

Source: Developed by the author.

Most observations (95.5%) were positive, highlighting the humanized care (40.8%) and general compliments about the service or professionals (38.2%). The four positive subcategories were related to the care provided by professionals who performed the service in the user's home.

Negative information about delays in scheduling or executing the service appeared five times, and criticisms regarding the lack of confirmation before the company carried out the examination at home were mentioned twice. However, according to the company that performs the service, both activities are the responsibility of the contracting companies (such as private health insurance plans). An important criticism mentioned was the participants' lack of access to test results, as the company only sends the results to the doctor or the contracting private health insurance.

The questions in the satisfaction survey about satisfaction with the scheduling sector and the response time for service received scores of 1.0. Checking the observations, it was possible to identify that these low scores were because some individuals who responded the survey had not scheduled the exam, thus giving a score of 1, as the question was not applicable and some report delays in providing care.

Although the problems in the satisfaction survey were mentioned four times, it was identified that even though users saw the score 1 instead of 10, the system registered the value 10. These four users were able to identify this error, as the numbering was in ascending order of importance. As mentioned, cases where system errors affected the final grades were excluded from the analysis at the beginning.

4 Discussion

The company performs six types of diagnostic imaging exams at home for a heterogeneous group. Although it serves newborns to centenarians, most patients are older people (75.7%). Patient satisfaction with the service was high (median 10.0) and the main observations identified were positive about the humanized care of the professionals who performed the service and general praise about the service. However, a minority reported delay in scheduling and executing the service and problems in the online survey.

Given the company's predominantly older customer base and projected demographic growth, human aging is a heterogeneous, natural and multifactorial process involving biological and psychological changes (Cochar-Soares; Delinocente; Dati, 2021). These changes can lead to the appearance of diseases and other health conditions, such as dementia, cancer, heart disease, diabetes, hypertension, osteoporosis, among others, resulting in disability, frailty and hospitalization. Furthermore, these diseases can influence the decrease in patients' quality of life, the burden on formal caregivers and family members and the increase in healthcare costs (National Institute On Aging, 2020; Pan American Health Organization, 2022). That said, the importance of early detection of health conditions for this population is identified. This can be verified in this study through the high prevalence of the older population in carrying out imaging diagnoses at home.

The present study identified high satisfaction with the care provided by a home diagnostic service. Therefore, this is a viable option to guarantee greater access for individuals to health services, corroborating the document "United Nations Decade of Healthy Ageing (2021-2030)", which emphasizes access to health care services for all individuals, regardless of economic income and geographic location, to ensure disease prevention and health promotion through technologies, diagnostics, vaccines, and medicines (United Nations, 2020).

A study by Facultad and Lee (2019) found that 99% of patients were very satisfied or satisfied with a hospital at home service. The present study also found a high patient satisfaction with a mean above 9.6 across all satisfaction domains. Thus, despite the services having different objectives (treatment vs. imaging), it appears that health services performed at home have high patient satisfaction.

Furthermore, the study by Toppenberg; Nielsen; Damsgaard (2022) found that older patients in care institutions had greater satisfaction with taking x-rays at home over those who underwent these exams in a hospital. That said, it is possible to verify that despite being just one type of diagnostic imaging exam, the high satisfaction with this home service is similar to the present study.

The observations in the responses to the satisfaction survey were mostly positive, with a large part being about the service provided by professionals, but it also appeared as negative in three responses. In a Facultad;

Lee (2019) survey on patient satisfaction with a home hospital service, qualitative comments were largely positive, mainly regarding the team, with most highlighting that professionals were friendly, kind, careful, attentive, supportive, among other compliments. However, two comments were negative, reporting that the professional was rude. Thus, in both studies, the service provided by professionals is a determining characteristic for customer satisfaction, and can generate positive or negative perceptions about the service.

In addition to the professionals, another negative factor about the service was the lack of direct access to the exam results, restricted to the health insurance plan or responsible professional. In addition, health plan patients do not schedule exams or receive the results, while the company's private patients schedule exams but do not receive the results either. Regarding this, while Steitz et al., (2023) found that a small portion (7.5%) of patients worried about receiving their results and them being abnormal, the majority (96%) of patients preferred immediate access to the results, even if they had not been verified by the healthcare professional treating them. Therefore, ensuring access to exam results is important for most patients in health services and must be taken into consideration, both in private companies and in the public health, to guarantee patients' autonomy in having knowledge about their health status.

A limitation of the study was that the company's satisfaction questionnaire included questions about scheduling, but some individuals didn't perform it. Since there was no "not applicable" option, they rated it poorly with 1.0 points. Taherdoost (2022) notes that questionnaire design can significantly impact research results and it's essential to analyze the questions. Future studies should include a "not applicable" option. However, allowing qualitative responses in observations enabled patients to report this issue. Another limitation is that the satisfaction survey is provided by the company, which may introduce response bias.

As strengths, this is the first study to identify the satisfaction of patients who received different types of home imaging diagnostic. The high satisfaction highlights the importance of this service. Additionally, the study included an open-ended question in which patients reported different key points in various aspects of the service, which could assist in its development and enhancement by companies, promoting greater access to healthcare services in both public and private sectors, especially for older adults who may face challenges in accessing traditional healthcare facilities.

5 Conclusion

Mapping user satisfaction made it possible to understand the needs in different aspects of the service. Verifying the high satisfaction with the service has impact and relevance, both scientifically, in filling the research gap, and clinically and socially, as it will allow the improvement of public policies regarding the regulation and execution of this type of service at home, being an essential service for older people and those with mobility difficulties. Future studies should investigate the perceptions of end-users, including stakeholders, regarding the provision of the service at home.

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Appendix A | Portable equipment used to perform mobile diagnostic imaging exams and the time to the diagnostic exam result to be available.

Type of exam	Equipment	Time for the exam results to be available
ECG	Micromed brand Wincardio	Up to 24 hours
Holter	Nomad Holter from Micromed brand	Up to 72 hours
Ambulatory Blood Pressure Monitoring	Micromed brand Mini MAP	Up to 72 hours
Ultrasound	LOGIQe from the Skintec brand	Up to 24 hours
Echocardiogram	LOGIQe from the Skintec brand	Up to 24 hours
Radiography	CDK brand CAPO	Up to 15 minutes

Source: Developed by the author.

Appendix B | Satisfaction questionnaire developed by the company

Satisfaction with the scheduling department (0 to 10)
Response time for service (0 to 10)
Cordiality of the professional (0 to 10)
Attention and care of the professional towards the patient (0 to 10)
Hygiene and attire of the professional (0 to 10)
Overall, how satisfied are you with our service? (0 to 10)
Observations (Open question)

Source: Developed by the author.

Appendix C | Descriptive analysis of satisfaction responses with services provided by the company X from February 2022 to June 2023.

Domains of Satisfaction	Minim.	Mean	Median	SD
Satisfaction with the scheduling sector	1	9.69	10	0.97
Response time for service	1	9.70	10	0.88
Professional cordiality	6	9.93	10	0.32
Professional attention and care for the patient	6	9.94	10	0.31
Professional hygiene and attire	6	9.92	10	0.37
Overall satisfaction with the service	5	9.89	10	0.44

Legend: Minim.: Minimum. SD: Standard deviation.

Source: Developed by the author.

Appendix D | Frequencies of satisfaction scores for each aspect of the service provided by the company from February 2022 to June 2023.

Satisfaction notes	Quantity	%
<i>Satisfaction with the scheduling sector</i>		
1	4	0.38
3	3	0.29
5	4	0.38
6	7	0.67
7	11	1.05
8	54	5.17
9	74	7.08
10	888	84.98
<i>Response time for service</i>		
1	2	0.19
3	2	0.19
4	1	0.10
5	4	0.38
6	7	0.67
7	10	0.96
8	54	5.17
9	86	8.23
10	879	84.11
<i>Professional cordiality</i>		
6	2	0.19
8	8	0.77
9	48	4.59
10	987	94.45

<i>Professional attention and care for patients</i>		
6	1	0.10
7	1	0.10
8	11	1.05
9	37	3.54
10	995	95.21
<i>Professional hygiene and attire</i>		
6	2	0.19
7	4	0.38
8	10	0.96
9	44	4.21
10	985	94.26
<i>Overall, how satisfied are you with our service?</i>		
5	1	0.10
6	3	0.29
7	3	0.29
8	12	1.15
9	68	6.51
10	958	91.67

Source: Developed by the author.