Original Research Article

Assessing Caregiver Satisfaction and Preferences in Pediatric Radiology: A Study on Communication and Safety Concerns

Sage Open Pediatrics
Volume 12: 1–8

DOI: 10.1177/30502225251378180
journals.sagepub.com/home/gph
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Abstract

Introduction: This cross-sectional study aimed to investigate the satisfaction and preferences of caregivers regarding communication about radiological safety.

Methods: Data were collected in major Palestinian hospitals via a questionnaire that explored participants' satisfaction with the information provided and the quality of communication by referring physicians.

Results: The final sample consisted of 282 caregivers. Most caregivers demonstrated high satisfaction with the adequacy of information regarding the indication for radiological testing (92.2%), but they were not satisfied with the information about radiation dose (56.8%). The majority were satisfied with the mutual discussions (90.8%), previous radiological tests (62.6%), and radiological information about the indicated examination (76.2%).

Conclusions: The quality of communication was inadequate. While most caregivers preferred receiving verbal and written information from providers, some preferred other sources of information, such as digital media. Interventions should use educational courses and develop policies to address communication problems regarding radiological safety.

Keywords

radiology, radiation risks, radiological safety, X-ray, CT scan, radiologists, communication, medical information

Received: April 19, 2025; revised: August 15, 2025; accepted: August 28, 2025.

Introduction

Communication in clinical practice is central to the delivery of health services. Effective communication is premised on having strong communication skills and the ability to establish good interpersonal relationships to facilitate information exchange and shared decision-making.[1-4] Effective communication and exchange of information enhance health outcomes by ensuring accurate diagnosis,[5] improving adherence to medical advice,[6] and increasing patient satisfaction and quality of life.[6-8] Moreover, the recent shift from paternalism to autonomy-based medicine has popularized the term "patient-centered care", whereby the patient's perceived health needs govern the decisions made in healthcare delivery.[9,10] As the patient is placed at the center of healthcare, effective communication is instrumental in making informed decisions.[11]

Effective information exchange in radiological care in particular is of the utmost importance because radiological care is associated with additional safety concerns. Exposure to ionizing radiation leads to a deterministic response manifested as tissue damage and a stochastic response manifested as genetic mutations and cancer. Dose-dependent tissue damage occurs when the amount of radiation exceeds a threshold dose,[12]

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leading to adverse health outcomes, such as cataracts,[13] infertility,[14] and skin damage.[15] The stochastic response manifests as direct or indirect DNA damage. Inadequate DNA repair and faulty repair mechanisms may lead to genetic mutations and cancer.[16] The probability of the stochastic response increases with radiation dose but the severity of this response is not dependent on a threshold dose.[12,17] Additionally, the latency period of the stochastic response may extend up to 2 decades.[18]

However, communicating about radiological safety is challenging for several reasons. First, explaining the mechanisms and pathophysiology implicated in radiation exposure is complicated, as it includes complex concepts, such as radiation dose. Second, risk-benefit dialogue can be influenced by overestimation of the risks. The risks of indicated radiological exams should be communicated in the context of benefits that almost always outweigh anticipated risks if the test is clinically indicated.[19] This is especially common in radiological care as multiple studies have reported a communication pattern that overemphasizes the risks at the expense of benefits.[20,21] Moreover, the risk perception of patients and caregivers is influenced by a variety of cultural, social, and personal factors, such as previous health experiences.[22,23] In addition to the radiologist, communicating the risks and benefits associated with a radiological test is the responsibility of the referring physician, who is the most preferred and trusted source of information but often lacks the knowledge to provide such information.[24,25]

The method of communicating about radiological examinations of children involves the healthcare professional, the caregiver, and the child. Radiographers' communication with competent children has been described as paternalistic and instructional, neglecting the child's concerns, needs, and emotions and further placing the child as a passive consumer of health services.[26-28] Effective communication with caregivers, as decision makers, is crucial for enhancing the quality of care, as it may influence the decision to undergo radiological examinations and the quality of radiological images.[29,30] Only two studies explored communication about radiological safety among caregivers of children undergoing imaging tests, revealing inadequate provision of information and poor knowledge regarding the risks and benefits associated with radiological tests.[24,31] Given the complexity of information about radiological safety, exploring the quality of communication and caregiver preferences is key for identifying and understanding the associated problems to inform possible interventions, guidelines and regulations. This study aimed to explore caregivers' satisfaction and preferences regarding communication and information about radiological safety.

Methods

Study Design and Settings

This was a cross-sectional, descriptive study conducted between August 2023 and October 2023. It was carried out at the radiology departments of four major hospitals in the West Bank: Rafidia Governmental Hospital, An Najah National University Hospital, Palestine Medical Complex, and Beit Jala Governmental Hospital.

Population and Sampling

According to the Palestinian Central Bureau of Statistics (PCBS), a total of 1,346,888 children were residents of the West Bank in 2023.[32] The online tool, *Raosoft*, was used to estimate the minimum sample size at 385 by choosing a desired level of confidence of 95%, and accepting margin of error.[33] Facilitators and barriers to approaching the minimum sample size were discussed in light of the limited resources of the present research study. A convenience sampling technique was used by inviting caregivers presenting to the radiology departments to participate. Participants were included if they were caregivers of children aged less than 18 years and were receiving X-ray, CT, or sonogram examination at a radiological department in a Palestinian hospital. Caregivers who had any cognitive limitations that might interfere with completing the questionnaire and understanding the objectives of the study were excluded.

Data Collection

The caregivers were approached and invited to participate in the research after signing a written consent, providing answers via a self-administered questionnaire with the help of the research team when necessary. This questionnaire was developed through a literature review of similar studies[26,32,35] conducted individually by each member of the research team. The accuracy, validity, and cultural appropriateness of the proposed draft were subsequently cross-checked and discussed by the researchers. Then, a panel of radiologists and epidemiologists, and public health professors were asked to review the modified version of the questionnaire for further modifications. Finally, the questions were reviewed by a group of experts, including pediatricians, radiologists, and public health practitioners, to ensure scientific relevance and optimal phrasing. Finally, a pilot study was carried out with 30 caregivers to ensure clarity and cultural acceptability of item phrasing.

The questionnaire consists of 3 sections. The first included questions on the background characteristics of the children participating in the study. The background

characteristics included demographic and personal information on age (categorized into levels: 0-3, 4-6, 7-9, 10-12, and 13-18 years); gender; area of residence (urban, rural, and refugee camp); relationship with caregiver (mother, father, brother, sister, and other); age of caregiver (as a continuous variable in years); and paternal and maternal educational level (did not receive formal education, primary, secondary, undergraduate, or postgraduate education). This part also included clinical questions on the type of imaging test (X-ray, CT scan, and sonogram); the targeted body location for imaging (head; long bone; non-long bone; chest, shoulder, and abdomen; pelvis; and miscellaneous location); and the number of previous exposures to medical radiation (continuous variable).

The second part consisted of three sections that explored caregiver satisfaction with the communication with the referring physician. First, satisfaction with the overall quality of information and communication that caregivers had received was rated on a scale from 1 to 10, where 1 indicates complete dissatisfaction and 10 indicates complete satisfaction. The second section used a 5-point Likert scale to ask participants to rate their satisfaction with the adequacy of the information across 3 domains: the indication for the radiological exam, radiation dose, and alternative tests. The third section used the same Likert scale design to rate satisfaction with the mutual discussion that caregivers had with the referring physicians regarding 3 issues: the clinical presentation of the child; information about the radiological test (the indication for, the radiation dose of, and alternative diagnostic options to the requested radiological test); and the previous radiological tests that the child had undergone. The Likert scale adopted a 5-point design whose possible answers ranged from fully dissatisfied to fully satisfied, with a "neutral" option.

The third part of the questionnaire investigated the future preferences of caregivers. A design of multiple choice questions was used to explore the preferred method of communication (verbal, written, or both); preferred source of information in addition to the healthcare professional (healthcare professionals only; digital media, including the internet and social media; traditional media, including TV and radio; both digital and traditional media); healthcare professional (radiologist, referring physician, or others); and type of information (type of radiation exam, consequences of radiation, the indication and rationale for radiation exposure).

Data Analysis

The data were coded, inserted, and analyzed using the Statistical Package for Social Sciences (IBM-SPSS) version 21. Only descriptive statistics were used to calculate the frequencies and percentages for categorical and ordinal variables and the means and standard deviations for continuous variables. The figures were used for better clarification of the items on a Likert scale.

Ethical Approval and Informed Consent

The study protocol was approved by the Ethics Committee of the Institutional Review Board (IRB) of An-Najah National University in Nablus (Reference number: (27) September 2019). It was reviewed by hospital and department officials. The purpose of the study and interview content were described to the participants, and written informed consent was obtained before starting the interview to confirm that participation was decided voluntarily. The collected data were kept confidential and were used only for research purposes.

Results

Of the 400 caregivers approached, 60 declined to participate (15%), and 58 were excluded based on the exclusion criteria (14.5%). The final sample comprised 282 caregivers of 282 children. The mean age of the children was 9.1 years (SD ± 5.6) (62.7%), and 173 (61.3%) were males and 109 (38.7%) were females. The majority of the participants resided in cities (59.6%), and more than a third resided in rural areas (35.5%). The mean age of the caregivers was 37.17 years (SD ± 10.17), 56.7% were mothers, 29.4% were fathers, 5% were sisters, and 4.3% were brothers to the child. Most of the fathers had an undergraduate education (61.7%), and nearly one-fifth had secondary education (20.9%). Maternal education level demonstrated a similar trend, as most participating mothers had an undergraduate-level education (66.0%), and 24.5% had a secondary-level education. Approximately two-thirds of the children underwent X-ray imaging (66.3%), 25.2% underwent CT, and only 8.5% underwent sonography. The chest, shoulder, and abdomen were the most common body locations targeted for imaging (33.7%), followed by miscellaneous locations (18.4%), small bones (16.3%), and long bones (16.0%) (Table 1).

The respondents demonstrated a good level of satisfaction with the overall quality of the communication and information they received from the referring physician, with a mean score of 7.6 (SD ± 1.89). The vast majority of respondents were satisfied or very satisfied (92.2%) with the information they received about the indication for the radiological exam, while most were dissatisfied or very dissatisfied (56.8%) with the information about the radiation dose. The responses regarding alternative radiological options were more divergent,

Table 1. Demographic, Social, and Clinical Characteristics of the Children.

Characteristics	Frequency (%)
Age	
0-3	57 (20.2)
4-6	33 (11.7)
7-9	49 (17.4)
10-12	45 (16.0)
13-18	98 (34.8)
Gender	
Female	173 (61.3)
Male	109 (38.7)
Area of residency	
Urban	168 (59.6)
Rural	100 (35.5)
Refugee camp	14 (5.0)
Relationship of caregiver	
Mother	160 (56.7)
Father	83 (29.4)
Brother	12 (4.3)
Sister	14 (5.0)
Others	13 (4.6)
Paternal educational level	
Did not receive formal education	9 (3.2)
Primary	19 (6.7)
Secondary	59 (20.9)
Undergraduate	174 (61.7)
Postgraduate	21 (7.4)
Maternal educational level	
Did not receive formal education	8 (2.8)
Primary	10 (3.6)
Secondary	69 (24.5)
Undergraduate	186 (66.0)
Postgraduate	9 (3.2)
Type of imaging test	
X-ray	187 (66.3)
CT-scan	71 (25.2)
Sonogram	24 (8.5)
Targeted body location for imaging	
Skull involvement	24 (8.5)
Small bone involvement	46 (16.3)
Long bone involvement	45 (16.0)
Chest shoulder abdomen	95 (33.7)
Pelvis	20 (7.1)
Miscellaneous	52 (18.4)

with 29.4% very dissatisfied and 25.5% very satisfied (see Figure 1).

Most respondents were satisfied or very satisfied (90.8%) with the mutual discussion they had with the referring physician about the clinical presentation of their children. Similarly, the majority of caregivers were satisfied or very satisfied with the mutual discussion

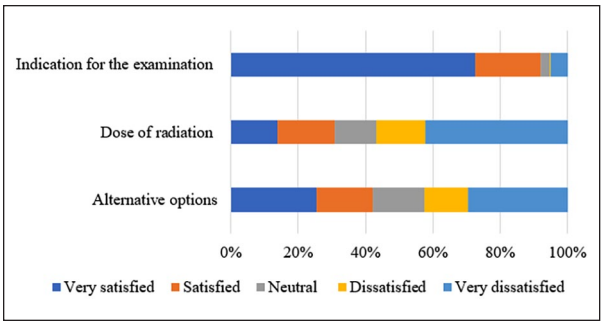

Figure 1. Level of satisfaction with the adequacy of received information.

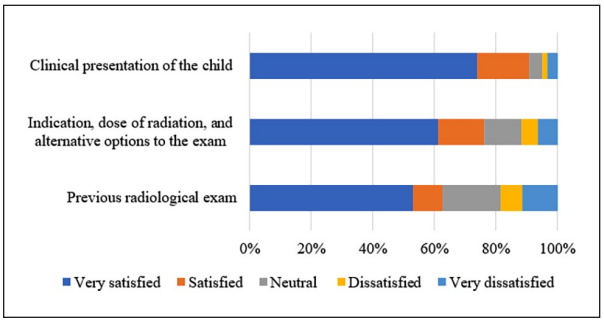

Figure 2. Level of satisfaction with the mutual discussion on the received information.

they had regarding the indication for and radiation dose and alternative options of the radiological exam (76.2%) and regarding the previous radiological exams and their impact (62.6%) (see Figure 2).

Most caregivers preferred to receive future information only from a healthcare professional (73.0%), while almost fourth preferred other sources in addition to the healthcare professional (25.5%), such as digital media (18.8%) and traditional media (3.5%). The majority preferred both verbal and written communication (62.4%), and approximately one-third preferred only verbal communication by a healthcare professional (34.4%). When asked about the healthcare provider they preferred to provide information, almost half of the respondents chose the referring physician (48.6%), while nearly the other half chose the radiologist (46.8%). Respondents preferred more information on the consequences of radiation exposure (83.3%), the type of radiation exam (37.9%), and the indication and rationale for radiation exposure (25.5%) (Table 2).

Discussion

Effective communication has become a necessity in the modern paradigm of healthcare delivery. This is particularly important in radiological care, in which various

Table 2. Caregivers' Preferences Regarding the Sources of Information, Methods of Information Delivery, Healthcare Professional, and Type of Information.

	Frequency (%)
Source of information	
Health care professionals	206 (73.0)
Traditional media	10 (3.5)
Digital media	53 (18.8)
Both digital and traditional	9 (3.2)
Missing	4 (1.4)
Method of information delivery	
Oral	97 (34.4)
Written	3 (1.1)
Both, oral and written	176 (62.4)
Missing	6 (2.1)
Preferred healthcare professional for communication	
Referring physician	137 (48.6)
Radiologist	132 (46.8)
Others	13 (4.6)
Type of information*	
Consequences of radiation	235(83.3)
Type of radiation exam	107 (37.9)
Indication and rationale for radiation exposure	71 (25.2)
Missing	1 (0.4)

*The total percentage exceeds 100%, as choices are not mutually exclusive with the possibility of multiple responses.

radiological tests may lead to adverse outcomes, such as cancer and tissue damage. Research has suggested gaps in the quality of communication carried out by physicians and in knowledge among caregivers of children undergoing radiological tests. Exploring communication problems, discussion dynamics, professional knowledge gaps, and caregivers' wishes may help inform interventions aiming to improve the quality of communication in radiological care. This study aimed to investigate the quality of communication and discussions between referring physicians and caregivers of children undergoing radiological tests and explore the future preferences of those caregivers.

This study reported adequate satisfaction regarding communication with referring physicians. This aligns with the findings of one local study wherein patients perceived physicians as competent at delivering clear clinical information with compassion and respect.[34] However, the findings of the present study also indicated that satisfaction with the communication about the clinical diagnosis and indication was greater than that with radiological information per se, such as radiation dose. The inadequacy of information related to radiological risks, in particular, was emphasized when most respondents (53.3%) expressed their wish to know more about the consequences of radiation in the future. This might be a global problem among referring physicians, as one study conducted among caregivers of children undergoing radiographs in Finland revealed similar findings. In this study, most caregivers received sufficient information on the symptoms of their children and the purpose of the radiograph, but only a minority did so on information related to radiation dose.[24]

This pattern of findings suggests that although physicians might have been competent in physician– patient communication, they might not have adequately provided information and engaged in detailed discussions when this information was more radiology related. This might indicate a potential gap in understanding of radiological risks. This aligns with the findings of previous studies conducted among healthcare professionals in Palestine. One local study revealed that physicians' knowledge, practices, and communication about radiological risks were suboptimal.[35] Similarly, other studies have reported inadequate knowledge of radiological risks among radio technicians[36] and medical students.[37] Based on these local studies, the lack of knowledge across multiple healthcare professions and career stages highlights the need for developing and providing radiation protection courses. These should be integrated into undergraduate curricula and offered as part of continuous medical education for healthcare professionals. Notably, one study reported that more than two-thirds of physicians in Palestine never took such courses during their academic or professional lives.[35]

This is part of the bigger picture in which radiological safety in Palestine is overlooked in policy-making and practice. A local study revealed that radiographers did not routinely use radiation shielding tools to safeguard patients from radiation exposure despite providing adequate knowledge about radiation safety.[38] Such protection measures are rarely applied because, in part, national health authorities and professional associations lack the political will to develop and enforce relevant guidelines and regulatory measures for radiological safety. In connection with the disregard of radiological safety in general, effective communication strategies for radiological safety have yet to be implemented. Health authorities and professional bodies should develop safety guidelines and facilitate risk-benefit communication by developing pertinent plans and policies, including the provision of related educational sessions and monitoring and evaluating patient satisfaction.

Multiple measures can be implemented by healthcare institutions to improve the communication of radiology information. First, communication should be emphasized in graduate medical education and training

modules. An example of a relevant and practical training approach is human simulation programs that rely on simulated patients (SPs), who are individuals trained to imitate real patients following standardized scenarios.[39] This approach can effectively improve communication and interpersonal skills, especially if training integrates patients' emotional state, adopts clear communication-based objectives, and incorporates diverse patient characteristics.[40] Moreover, standardized scripts can be embedded in electronic medical records (EMRs) to complement communication and deliver consistent messaging. This can be enhanced by decision aids and patient education material to improve caregiver understanding and satisfaction.

These strategies can also benefit from established international frameworks, such as the WHO's guide on communicating radiation risks in paediatric imaging, which outlines several professional- and patient-centred communication approaches. For instance, it recommends that referring physicians hold simple, clear, benefit-focused discussions with caregivers, after which radiologists can follow up with procedure- and dose-related details. The guide also emphasizes the need to involve all relevant healthcare workers, including referrers, radiographers, nurses, and receptionists, in enhancing communication by responding to questions, using educational materials, and adopting a simple language to ensure consistent, effective, and ongoing dialogue throughout the care pathway.[41] However, these global approaches should be tailored to the Palestinian social, cultural, and linguistic characteristics to accommodate caregiver expectations and communication preferences. Indirect communication styles and deference to medical hierarchy are common in the Palestinian settings, mandating attention to nonverbal cues, exploration of caregiver concerns, and proactive invitation of questions.[42-44] Moreover, as families are collectivist and central to decision-making in healthcare, communication strategies should involve key family members and consider the sociocultural norms of respect and authority.[42-44]

Furthermore, a considerable minority of the participants in the present study stated a preference for receiving information from multiple sources outside healthcare settings, such as traditional and digital media. In one study conducted among caregivers of children undergoing medical imaging, half of the participants preferred the internet as a source of radiological information.[31] Given the inevitable use and widespread popularity of the internet, technology should serve as a supplementary source of information to complement direct communication with healthcare professionals, who can guide patients to use mobile applications, social media, and the internet to obtain information on radiation safety. For instance, several mobile applications have been developed to calculate the entrance surface air kerma (ESAK) as an estimator of radiation exposure.[45]

Notably, in addition to providing verbal communication, some caregivers preferred written information provided by healthcare professionals in addition to verbal communication. Other studies have also reported that patients prefer receiving detailed yet simple written information related to radiological examinations.[24,46] Such written information can be provided through educational materials, such as brochures and pamphlets, which can be effective tools for increasing the knowledge about radiological safety. A study conducted among a similar population of caregivers reported that more than one-third of the participants preferred pamphlet-delivered information.[31] The "*What Parents Should Know about Medical Radiation Safety*" brochure is an example of a comprehensive, simple written instrument used to circulate information about the risks and benefits involved in nuclear radiology, which can be replicated to address various topics in radiology.

This study contributes to the scarce research assessing physicians' communication and provision of medical information in the region, especially in the field of radiology. Moreover, the study sample was representative of the Palestinian population, as it included participants from almost every city in the West Bank. The sample size also exceeded that of other studies carried out among caregivers of children undergoing medical imaging globally. This study has several limitations. Although the findings are comparable with those of other studies conducted globally, most of these findings should not be generalized to other populations in different settings. This is because the gaps in healthcare communication can be attributed to the drawbacks of the national healthcare system, such as the lack of strategies, regulations, and stewardship. In addition to the peculiar social and cultural characteristics inherent in the population's buildup, these characteristics influence many aspects of health service delivery. Furthermore, responses to questions measuring satisfaction often lean toward positivity, resulting in a positive skew. Moreover, the use of a convenient sampling method could not eliminate the inherent bias of subjective selection, thereby compromising internal validity. Additionally, the nature of the cross-sectional study design precluded the establishment of causality between the variables.

Conclusion

With the recent shift toward patient autonomy and patient-centered care, effective communication and informed discussion have become pillars of healthcare delivery. As potential complications may ensue from various radiological tests, effective exchange of

information is crucial for making informed decisions and improving the quality of care. This study aimed to explore the adequacy of information and discussions between physicians referring children to radiological examinations and caregivers of those children. The study also aimed to identify the future preferences of caregivers concerning radiological care. Although the overall quality of communication was satisfactory, information exchange and discussions about radiological tests were inadequate. Caregivers also expressed a preference for receiving both verbal and written information from healthcare professionals, with a considerable minority preferring other sources of information, such as digital media. National health authorities and professional bodies should address the poor knowledge and communication among referring physicians by providing educational courses and developing effective policies to improve the quality of communication about the risks and benefits of radiological examinations. Moreover, the popularity of technology amounts to an added opportunity to complement the information received in radiological care.

Acknowledgments

We would like to express our gratitude to all parents who participated in this study. We would also like to thank the Palestinian Ministry of Health for their kind approval and support for the data collection process.

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Ethical Considerations

The study protocol was approved by the Ethics Committee of the Institutional Review Board (IRB) of An-Najah National University in Nablus and was reviewed by hospital and department officials. The purpose of the study and interview content were described to the participants, and written informed consent was obtained before starting the interview to confirm that participation was decided voluntarily. The collected data were kept confidential and were used only for research purposes.

Consent to Participate

Written informed consent was obtained from each study participant, or their legally authorized representative when applicable, after they were informed of the study's objectives. To maintain anonymity, participants' names and other identifying information were not recorded in the data collection systems.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Data Availability Statement

Upon a reasonable request, the corresponding author may provide the datasets used in this study.

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