



Informing and Preparing Patients for Echocardiography

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Abstract

Aim. To examine the awareness and preparedness of patients for echocardiography regarding age, gender, education level, and the type of examination.

Methods. A cross-sectional study included patients who came for echocardiography through the outpatient clinic and Clinical Departments of the Clinical Hospital Center Osijek during March and April 2023. A survey questionnaire developed for this research was used as the research instrument on patients' awareness and preparedness for echocardiography.

Results. The study included 106 participants, of which 52 (49%) were males and 54 (51%) were females, with 51% of them having undergone 1 - 3 echocardiographic examinations before. Most participants, 83 (78%), received information verbally. There was no significant difference in the awareness and preparation of participants for echocardiography regarding gender and age. Participants with higher education levels agreed that they knew how the examination was conducted before coming, unlike participants with lower levels of education, and there was a significant statistical difference between the groups ($p=0.02$). Participants who underwent transesophageal echocardiography stated that they were better informed and prepared compared to those who underwent transthoracic echocardiography ($p=0.01$).

Conclusion. The results of the conducted research indicate that participants are well informed and prepared for echocardiographic examinations, with no significant differences based on gender and age. Participants who underwent transesophageal ultrasound of the heart considered themselves better informed and prepared compared to those who underwent transthoracic echocardiography.

Introduction

Echocardiography, or cardiac ultrasound, is a diagnostic examination that provides insight into the comprehensive anatomy and physiology of the heart, as well as guiding further diagnostic and therapeutic procedures (1). Echocardiography is used for diagnosing congenital and acquired heart defects, cardiomyopathies, inflammatory heart diseases, acute myocardial infarction, cardiac tumors, and diseases of the major blood vessels entering and leaving the heart. It assesses the dimensions of cardiac structures, the elasticity of cardiac walls, and overall heart muscle strength, and displays heart valves along with the heart's pump function (2). Ultrasound has multiple working methods, including two-dimensional, three-dimensional ultrasound, Doppler and color Doppler, and strain imaging as diagnostic tests for echocardiography (1). In addition to these techniques, there is also stress echocardiography and transthoracic echocardiography (TTE) as the most commonly used method, which is painless and non-invasive. There are also invasive diagnostics, transesophageal echocardiography (TEE), which is often performed under anesthesia, and intracardiac echocardiography, which is very rare and performed under anesthesia (1). Transesophageal ultrasound provides a better view of certain heart structures, making various abnormalities of heart valves or clots inside the heart visible with this method (3). There are no contraindications for TTE. Contraindications for TEE include swallowing disorders, bleeding from the esophagus, tumors, radiotherapy of the mediastinum, thoracic aorta aneurysms, and various esophageal changes such as strictures, diverticula, varicosities, and tumors (4). Aside from an allergic reaction to the gel, TEE has no significant complications. Possible complications of TEE are rare but can be associated with trauma to the teeth, oral mucosa, and esophagus, and they can rarely include breathing problems, aspirational pneumonia, difficulty swallowing, arrhythmias, bleeding, esophageal perforation, infections, and more (5).

Ultrasound Physiology

The ultrasound machine used for cardiac examinations employs ultrasound waves that are emitted toward the heart using a probe. These waves reflect off cardiac structures and are then transmitted to

the machine and processed using special computer programs to create an image of cardiac structures on the monitor (6). Unlike standard TTE, the probe that generates sound waves for TEE is attached to a thin tube that passes through the mouth, down the throat, and into the esophagus. Since the esophagus is directly behind the heart, images of cardiac structures and valves are much more detailed (6). The actual images and sound recordings can be stored on a portable disk or other media such as a compact disc (CD) for later review or to provide to the patient for further assessment or second opinions, and they can also be exchanged via telemedicine for consultations or research purposes (7).

Patient Information and the Role of the Nurse

In recent years, the importance of patient information has been emphasized. Not only does the patient have the right to be informed and have the right to know everything about their health condition, but by being informed, the patient also facilitates cooperation with the medical staff during diagnostic procedures and treatment. To help the patient understand the manner and reason for conducting certain tests, it is necessary to explain the type of examination clearly and concisely and describe how the examination is conducted and what the patient should do and expect during the diagnostic procedure (8). After the patient receives the necessary information about the diagnostic procedure, the patient is given informed consent, which needs to be signed by the patient to confirm their agreement to undergo the examination and to confirm their understanding of the provided information (9). Informed consent is a statement from the patient that authorizes the doctor to conduct the diagnostic examination in this case, and it is stored in the patient's documentation, among other things, for legal protection. In addition to the written information form, there is also a need for oral communication between the medical staff and the patient, as this allows the patient to ask questions and receive direct and clear answers (10). During communication with the patient, the nurse provides as much information as they are authorized to give. The most important thing is to understand the patient, be ready to answer their questions and provide emotional support to both the patient and the family members involved in the patient care. When arriving for a diagnostic examination, the patient may have a certain level of

fear, both about the outcome of the examination and not knowing what will be done and how the examination will be conducted. To help the patient relax before and during the examination, the nurse plays an important role in this aspect. Above all, the patient should be informed that echocardiography is a diagnostic procedure that does not cause pain. Patients may be afraid of pain during the examination.

Examination and the Role of the Nurse

Before performing the diagnostic examination, it is necessary to identify the patient. The physician reviews the medical documentation brought by the patient and then explains the procedure. During the examination, it is essential to follow the protocol for conducting the examination, including positioning the patient, in which the nurse plays a significant role, in ensuring the accuracy and objectivity of the obtained ultrasound images (11). Sometimes, psychological preparation is more challenging and more important than the physical preparation of the patient (12). Problems related to performing diagnostic examinations can arise when some of the basic human needs in Maslow's hierarchy are not met for the patient. Every person needs security, respect, and self-esteem (12). The nurse receives the patient and prepares and positions them. During the echocardiogram, the patient lies on their left side or their back, undressed from the waist up. The patient's position on the left side allows for a higher-quality display on the ultrasound machine screen (11). The heart rests against the left chest wall, allowing for a much more accurate diagnostic examination (13). The nurse also places electrodes on the patient's back to record an electrocardiogram and informs the patient about the course of the examination (14). The nurse not only instructs the patient on which position to take but, as needed, depending on the patient's condition, assists in assuming the position and often holds the patient. Occasionally, the examination may be uncomfortable because the physician needs to apply more pressure with the probe to the chest. In case the patient cannot endure the discomfort, they are asked to signal. The diagnostic examination itself lasts from 20 to 45 minutes, depending on the course of the examination and the findings.

Transesophageal Ultrasound and the Role of the Nurse

The performance of transesophageal ultrasound differs from preparation to execution. If there is a need for transesophageal ultrasound, the nurse must establish venous access, and administer pre-medication, and analgesic spray in the form of a spray injected into the esophagus to ease and reduce the pain and discomfort during the insertion of the ultrasound probe. Before the examination, if it is found that the patient has artificial teeth or a part of a dental prosthesis, it needs to be removed for the patient's safety during the examination (15). The examination is performed in the same position as a regular heart ultrasound. The patient is fitted with a shield for the probe, which is covered with their lips and held during the examination. Once the patient is positioned and anesthetized, the physician introduces the transesophageal probe, which passes through the esophagus, with a swallowing motion made for the probe to pass into the esophagus. During the examination, the patient is calmed, and they are reminded of the need to breathe through their nose. The length of the examination depends on the indications for the examination. The patient should not eat or drink anything 4-6 hours before the examination, and after the examination, they may experience a feeling of throat swelling and numbness due to sedation, they are also informed that they should not eat for 2 hours after the examination until the mentioned feeling disappears (5). A patient coming for TEE, if not informed and prepared, can lead to the postponement of the examination (and therefore the diagnosis) and possible complications. Similarly, although in TTE, preparedness does not affect the examination findings, patients experience fear because they do not know what to expect, so it should not be assumed that there is no need for preparation for the examination. No research was found in the available literature examining the awareness and preparation of patients for echocardiography, and we decided to fill this gap. This research aims to examine the awareness and preparation of patients for echocardiography regarding age, gender, education level, and the type of examination.

Methods

Participants

A cross-sectional study was conducted at the Clinic for Internal Medicine of the Clinical Hospital Center Osijek (KBC) for two months (March and April 2023). The participants were patients who underwent echocardiography through the clinic and clinical departments of KBC Osijek, who voluntarily agreed to participate in the study and completed a survey questionnaire. The questionnaire was filled out after the echocardiography was performed. A total of 106 participants were included. Inclusion criteria were participants who signed informed consent to participate in the study, underwent the examination at the Department of Heart and Blood Vessel Diseases, KBC Osijek, were older than 18 years, cognitively intact without severe mental changes, understood, and spoke the Croatian language. Exclusion criteria were participants who did not sign informed consent to participate in the study, participants who did not have the examination at the Department of Heart and Blood Vessel Diseases, KBC Osijek, participants younger than 18 years, dementia, and psychiatric diagnoses obtained from a review of medical documentation. Participants were informed about the way to prepare for an echocardiographic examination when scheduling an appointment. Participants were included in the study, whether they had previously undergone echocardiography and had been informed in the same way or whether they were coming for the first time for these examinations.

Personal data protection

Personal data provided are processed in accordance with the General Data Protection Regulation (Regulation (EU) 2016/679) using adequate physical, technical, and security protection measures. At any time, the participant has the right to request access, review, supplement, or delete their private information and the right to limit processing, data modularity, and the right to revoke consent.

Ethics

The study was conducted by the principles of the Declaration of Helsinki. Ethical approvals were obtained from the Ethics Committee of Nurses-Technicians of the Clinical Hospital Centre Osijek (R1-1946-4/2023) and the Ethics Committee of the Faculty of Dental Medicine and Health (2158/97-97-10-23-16).

Instrument

After the echocardiography was performed, the participants were thoroughly explained the research and, if they agreed to participate in the study, they received informed consent for signing. After they signed the informed consent, the participants completed a survey questionnaire independently. The questionnaire was based on a review of the literature (16,17). The questionnaire consisted of six general questions and 15 statements about awareness of echocardiography. In the statements, participants were asked to agree with each statement on a five-point Likert scale, from "strongly disagree" - 1 to "strongly agree" - 5.

Statistics

Categorical data are presented with absolute and relative frequencies. Numerical data are described by the median and interquartile range boundaries and arithmetic mean and standard deviation. The normality of the distribution of numerical variables was tested with the Kolmogorov-Smirnov test. The Kolmogorov-Smirnov test showed in all questionnaire items that the distribution deviates from normal regarding gender, age, and type of examination, with $p < 0.001$, and in statements 1, 2, 4, and 12 regarding education level, with $p > 0.05$. Due to the deviation from a normal distribution, numerical variables between two independent groups were tested with the Mann-Whitney U test, while differences between three or more independent variables were tested with the Kruskal-Wallis test. All p-values are two-sided. The level of significance was set at $\alpha = 0.05$. Statistical analysis was performed using the SPSS software (version 22.0, SPSS Inc., Chicago, IL, USA).

Results

Participants' Demographics

A total of 106 participants took part in the study, of which 52 (49%) were males, and 54 (51%) were females. The average age was 55 years (SD 17.42) ranging from 20 to 89 years. Most participants, 60 of them (57%) had a secondary education level. Out of the 106 participants, 52 (49%) underwent a transthoracic, and 54 (51%) underwent a transesophageal echocardiography, with 54 (51%) of them already having undergone 1-3 echocardiographic examinations. Most participants, 83 of them (78%), were informed verbally.

Participants' Views on Awareness and Preparation for Echocardiography

The results indicate that participants are well-informed and prepared for echocardiographic examinations.

Comparison of Participants' Awareness and Preparation by Gender

There is no significant difference in participants' awareness and preparation for echocardiography by gender. However, a larger number of males disagree with the statement that they knew the conditions for which the examination was performed before their scheduled appointment, compared to females who are uncertain about knowing the purpose of the examination.

Table 1. **General Information About Participants**

		Number and (%) of participants
Gender	Male	52 (49)
	Female	54 (51)
Age	20 - 35	20 (19)
	36 - 50	21 (20)
	51 - 65	28 (26)
	66 and older	37 (35)
Education Level	Elementary School	7 (6)
	Secondary School	60 (57)
	Bachelor's Degree	25 (24)
	Master's Degree	10 (9)
Number of Previous Echocardiographic Examinations	0	43 (41)
	1 - 3	54 (51)
	4 - 7	7 (6)
	8 - 10	0 (0)
	More than 10	2 (2)
Type of Echocardiographic Examination	Transthoracic Echocardiography - TTE	52 (49)
	Transesophageal Echocardiography - TEE	54 (51)
Awareness about Echocardiography	Not informed	20 (19)
	Informed in writing	3 (3)
	Informed orally	83 (78)
Total Number of Participants		106 (100)

Table 2. Awareness and Preparation of Participants for Echocardiography

Statement	Number and % of Participants					Total	M (SD)
	1	2	3	4	5		
1. I knew where the examination was performed.	54 (51)	6 (6)	0 (0)	19 (18)	27 (25)	106 (100)	2,61 (1,781)
2. I knew how the examination was performed.	38 (36)	7 (7)	1 (1)	30 (28)	30 (28)	106 (100)	3,07 (1,714)
3. I was informed about the procedure and scope of echocardiography.	9 (8)	5 (5)	5 (5)	46 (43)	41 (39)	106 (100)	3,99 (1,183)
4. I was informed about the steps before echocardiography.	8 (7)	4 (4)	9 (8)	40 (38)	45 (43)	106 (100)	4,04 (1,162)
5. I received information about the examination that was clear and understandable.	1 (1)	2 (2)	5 (5)	44 (41)	54 (51)	106 (100)	4,40 (0,752)
6. I was informed about the positive and negative factors of echocardiography.	0 (0)	0 (0)	6 (6)	42 (40)	58 (54)	106 (100)	4,49 (0,605)
7. I was informed about the examination and its preparation.	0 (0)	0 (0)	1 (1)	42 (40)	63 (59)	106 (100)	4,58 (0,551)
8. I was informed about possible side effects and the course of the examination.	0 (0)	1 (1)	1 (1)	41 (39)	63 (59)	106 (100)	4,57 (0,569)
9. Information about the procedure and results were clearly communicated.	2 (2)	3 (3)	4 (4)	38 (36)	59 (55)	106 (100)	4,41 (0,848)
10. I was provided with information that reduced my discomfort.	1 (1)	1 (1)	0 (0)	40 (38)	64 (60)	106 (100)	4,56 (0,649)
11. I was informed of the need to bring medical documentation.	0 (0)	1 (1)	1 (1)	34 (32)	70 (66)	106 (100)	4,63 (0,558)
12. I was informed about whether I needed to be fasting before the scheduled appointment.	1 (1)	2 (2)	21 (20)	17 (16)	65 (61)	106 (100)	4,35 (0,926)
13. I was informed about whether I could consume food and water immediately after the examination.	0 (0)	1 (1)	0 (0)	26 (24)	79 (75)	106 (100)	4,73 (0,508)
14. I am satisfied with communication before, during, and after the examination.	0 (0)	0 (0)	0 (0)	30 (28)	76 (72)	106 (100)	4,72 (0,453)
15. I am satisfied with the engagement and education during and after the examination.	0 (0)	0 (0)	0 (0)	29 (27)	77 (73)	106 (100)	4,73 (0,448)

1-I don't agree; 2-mostly disagree; 3-neither agree nor disagree; 4- mostly agree; 5-I agree

Table 3. Information and preparation of respondents for echocardiography concerning gender

Statement	Median (interquartile range)		p*
	Male	Female	
1. I knew where the examination was performed.	1 (1 - 4)	3 (1 - 5)	0.12
2. I knew how the examination was performed.	4 (1 - 4)	4 (1 - 5)	0.16
3. I was informed about the procedure and scope of echocardiography.	4 (4 - 5)	4 (4 - 5)	0.39
4. I was informed about the steps before echocardiography.	4 (4 - 5)	4 (4 - 5)	0.61
5. I received information about the examination that was clear and understandable.	4 (4 - 5)	5 (4 - 5)	0.60
6. I was informed about the positive and negative factors of echocardiography.	5 (4 - 5)	5 (4 - 5)	0.61
7. I was informed about the examination and its preparation.	5 (4 - 5)	5 (4 - 5)	0.66
8. I was informed about possible side effects and the course of the examination.	5 (4 - 5)	5 (4 - 5)	0.72
9. Information about the procedure and results were clearly communicated.	5 (4 - 5)	5 (4 - 5)	0.34
10. I was provided with information that reduced my discomfort.	5 (4 - 5)	5 (4 - 5)	0.59
11. I was informed of the need to bring medical documentation.	5 (4 - 5)	5 (4 - 5)	0.50
12. I was informed about whether I needed to be fasting before the scheduled appointment.	5 (4 - 5)	5 (3,75 - 5)	0.84
13. I was informed about whether I could consume food and water immediately after the examination.	5 (5 - 5)	5 (4 - 5)	0.17
14. I am satisfied with communication before, during, and after the examination.	5 (4 - 5)	5 (4 - 5)	0.76
15. I am satisfied with the engagement and education during and after the examination.	5 (4 - 5)	5 (4 - 5)	0.92

* Mann-Whitney U test; 1-I don't agree; 2-mostly disagree; 3-neither agree nor disagree; 4- mostly agree; 5-I agree

Comparison of Participants' Awareness and Preparation by Age

There is no significant difference in participants' awareness and preparation for echocardiography by age. Participants in the 20-35 age group mostly agreed with the statement that they knew the conditions for which the examination was performed before their scheduled appointment, while participants in older age groups disagreed with this statement, but it is not statistically significant.

Comparison of Participants' Awareness and Preparation by Education Level

There is a significant difference between groups regarding the education level in the statement that they knew the conditions for which the examination was performed before their scheduled appointment. Participants with a completed higher education degree agree with this statement compared to other groups who mostly agree, and there is a significant difference between groups. Additionally, participants with a higher professional qualification agree with the statement about knowing how the examination is performed before the appointment, compared to participants with primary education, secondary education, and higher education level, who mostly agree, and there is a significant difference between the groups.

Table 4. Information and preparation of subjects for echocardiography concerning age

Statement	Median (interquartile range)				<i>p</i> *
	20 - 35	36 - 50	51 - 65	66 <	
1. I knew where the examination was performed.	4 (1 - 5)	1 (1 - 4,5)	1 (1 - 5)	1 (1 - 4)	0.64
2. I knew how the examination was performed.	4 (1,25 - 5)	2 (1 - 4,5)	4 (1 - 5)	4 (1 - 5)	0.76
3. I was informed about the procedure and scope of echocardiography.	4 (4 - 5)	4 (3 - 5)	4 (4 - 5)	4 (4 - 5)	0.45
4. I was informed about the steps before echocardiography.	4,5 (4 - 5)	4 (3,5 - 5)	4 (4 - 5)	4 (3 - 5)	0.40
5. I received information about the examination that was clear and understandable.	5 (4 - 5)	4 (4 - 5)	5 (4 - 5)	5 (4 - 5)	0.41
6. I was informed about the positive and negative factors of echocardiography.	5 (4 - 5)	4 (4 - 5)	5 (4 - 5)	5 (4 - 5)	0.80
7. I was informed about the examination and its preparation.	5 (4 - 5)	5 (4 - 5)	5 (4 - 5)	5 (4 - 5)	0.66
8. I was informed about possible side effects and the course of the examination.	5 (4 - 5)	5 (4 - 5)	5 (4 - 5)	5 (4 - 5)	0.46
9. Information about the procedure and results were clearly communicated	5 (4 - 5)	5 (4 - 5)	5 (4 - 5)	4 (4 - 5)	0.18
10. I was provided with information that reduced my discomfort.	5 (4 - 5)	5 (4 - 5)	5 (4 - 5)	5 (4 - 5)	0.48
11. I was informed of the need to bring medical documentation.	5 (4 - 5)	5 (4 - 5)	5 (5 - 5)	5 (4 - 5)	0.22
12. I was informed about whether I needed to be fasting before the scheduled appointment.	5 (3,25 - 5)	5 (4 - 5)	5 (4,25 - 5)	5 (3 - 5)	0.42
13. I was informed about whether I could consume food and water immediately after the examination.	5 (4 - 5)	5 (4 - 5)	5 (5 - 5)	5 (4,5 - 5)	0.25
14. I am satisfied with communication before, during, and after the examination.	5 (4 - 5)	5 (4 - 5)	5 (5 - 5)	5 (4 - 5)	0.47
15. I am satisfied with the engagement and education during and after the examination.	5 (4 - 5)	5 (4 - 5)	5 (5 - 5)	5 (4 - 5)	0.35

*Kruskal-Wallis test; 1-I don't agree; 2-mostly disagree; 3-neither agree nor disagree; 4- mostly agree; 5-I agree

Table 5. Information and preparation of respondents for echocardiography concerning the level of education

Statement	Median (interquartile range)				p*
	ES	HS	BD	MD	
1. I knew where the examination was performed.	2 (1 - 4)	1 (1 - 4)	4,5 (3,25 - 5)	1 (1 - 4,5)	0.005
2. I knew how the examination was performed.	4 (1 - 5)	4 (1 - 4)	5 (3,25 - 5)	4 (1 - 4,5)	0.02
3. I was informed about the procedure and scope of echocardiography.	4 (4 - 5)	4 (3 - 5)	4,5 (4 - 5)	4 (4 - 5)	0.07
4. I was informed about the steps before echocardiography.	4 (3 - 5)	4 (4 - 5)	4,5 (3 - 5)	5 (4 - 5)	0.17
5. I received information about the examination that was clear and understandable.	5 (4 - 5)	4 (4 - 5)	5 (4 - 5)	5 (4 - 5)	0.13
6. I was informed about the positive and negative factors of echocardiography.	5 (4 - 5)	4 (4 - 5)	5 (4 - 5)	5 (4 - 5)	0.13
7. I was informed about the examination and its preparation.	5 (4 - 5)	5 (4 - 5)	5 (4 - 5)	5 (4 - 5)	0.40
8. I was informed about possible side effects and the course of the examination.	5 (4 - 5)	5 (4 - 5)	5 (4 - 5)	5 (4 - 5)	0.39
9. Information about the procedure and results were clearly communicated.	5 (4 - 5)	4 (4 - 5)	5 (4 - 5)	4 (4 - 5)	0.22
10. I was provided with information that reduced my discomfort.	4 (4 - 5)	5 (4 - 5)	5 (4 - 5)	5 (4 - 5)	0.33
11. I was informed of the need to bring medical documentation.	5 (4 - 5)	5 (4 - 5)	5 (4 - 5)	5 (4 - 5)	0.49
12. I was informed about whether I needed to be fasting before the scheduled appointment.	4 (3 - 5)	5 (4 - 5)	5 (3 - 5)	5 (4 - 5)	0.62
13. I was informed about whether I could consume food and water immediately after the examination.	5 (4 - 5)	5 (4 - 5)	5 (4 - 5)	5 (4 - 5)	0.13
14. I am satisfied with communication before, during, and after the examination.	5 (4 - 5)	5 (4 - 5)	5 (4,75 - 5)	5 (5 - 5)	0.40
15. I am satisfied with the engagement and education during and after the examination.	5 (4 - 5)	5 (4 - 5)	5 (4,75 - 5)	5 (5 - 5)	0.27

* Kruskal-Wallis test; 1-I don't agree; 2-mostly disagree; 3-neither agree nor disagree; 4- mostly agree; 5-I agree

Table 6. Information and preparation of respondents for echocardiography regarding the type of echocardiographic examination

Statement	Median (interquartile range)		p*
	TEE	TTE	
1. I knew where the examination was performed.	2 (1 - 4)	1 (1 - 5)	0.66
2. I knew how the examination was performed.	4 (1 - 4,75)	3,5 (1 - 5)	0.42
3. I was informed about the procedure and scope of echocardiography.	4 (4 - 5)	4 (3 - 5)	0.25
4. I was informed about the steps before echocardiography.	4 (4 - 5)	4 (3 - 5)	0.39
5. I received information about the examination that was clear and understandable.	5 (4 - 5)	4 (4 - 5)	0.49
6. I was informed about the positive and negative factors of echocardiography.	5 (4 - 5)	4,5 (4 - 5)	0.46
7. I was informed about the examination and its preparation.	5 (4 - 5)	5 (4 - 5)	0.46
8. I was informed about possible side effects and the course of the examination.	5 (4 - 5)	5 (4 - 5)	0.68
9. Information about the procedure and results were clearly communicated.	5 (4 - 5)	5 (4 - 5)	0.56
10. I was provided with information that reduced my discomfort.	5 (4 - 5)	5 (4 - 5)	0.40
11. I was informed of the need to bring medical documentation.	5 (4 - 5)	5 (4 - 5)	0.19
12. I was informed about whether I needed to be fasting before the scheduled appointment.	5 (4 - 5)	4 (4 - 5)	0.01
13. I was informed about whether I could consume food and water immediately after the examination.	5 (5 - 5)	5 (4 - 5)	0.63
14. I am satisfied with communication before, during, and after the examination.	5 (5 - 5)	5 (4 - 5)	0.11
15. I am satisfied with the engagement and education during and after the examination.	5 (5 - 5)	5 (4 - 5)	0.06

* Mann-Whitney U test; TEE - transesophageal echocardiography; TTE - transthoracic echocardiography; 1-I don't agree; 2-mostly disagree; 3-neither agree nor disagree; 4- mostly agree; 5-I agree

Comparison of Participants' Awareness and Preparation by Type of Examination (TEE or TTE) Participants who underwent TEE significantly agreed that the nurse/technician informed them not to eat or drink before the scheduled appointment, compared to participants who underwent TTE. Participants who underwent TEE completely agreed that they were satisfied with the professionalism, approach, and knowledge before, during, and after the examination, compared to participants who underwent TTE, but it is not statistically significant.

Discussion

This research investigated the awareness and preparation of patients undergoing echocardiography. The results of the study suggest that patients are well-informed and adequately prepared for echocardiographic examinations. A meta-analysis, including 38 studies with over six thousand patients, revealed that patient-oriented interventions increased patient knowledge (10). The predominance of female patients undergoing echocardiography could be attributed to the growing interest in cardiovascular disease among women in the last decade (18). Additionally, the mortality rate due to cardiovascular diseases is higher in women (48%) than in men (37%) (18). This research found that out of a total of 106 participants, 51% had already undergone echocardiography 1-3 times. The increased frequency of echocardiography is due to advances in medicine and diagnostics. Echocardiography is an indicator of simple and congenital heart defects in adults, and it is used to diagnose such conditions that, due to their low hemodynamic significance and complexity, are often only discovered in adulthood (19). When it comes to age, there were no significant differences in awareness. However, participants between the ages of 20-35 generally agreed that they knew the conditions for which the examination was performed before their appointment, compared to older participants, which could be attributed to the availability of information via the internet and higher internet usage in younger populations (20). Research in 2010 by Medicus found that 80-85% of adults used the internet to search for medical and health-related information, with varying rates across different regions (21). Moreover, research by the European Commission in 2014 indicated that 59% of the participants in 28 European Union Member States used the internet to seek health information in the previous year (22). Participants with higher education levels were more knowledgeable about the examination process, which is consistent with research showing that a higher level of education correlates with greater health literacy (23). Effective communication and preparation are essential for both the patient and the medical team performing the examination. Participants who underwent transesophageal ultrasound of the heart reported in this study that they

were better informed and prepared than participants undergoing transthoracic ultrasound. This suggests that communication plays a crucial role in preparing patients for the examination. It also indicates that patients without a medical background need clear explanations, even for simple procedures. Healthcare providers may assume that patients undergoing transesophageal ultrasound require more detailed explanations, and they dedicate more time to providing information. Despite transesophageal ultrasound being an invasive method compared to transthoracic ultrasound, patients were better prepared. This highlights the importance of not making assumptions about whether a procedure is painless or non-invasive and emphasizes the need to inform patients about the preparation process. Nurses should possess the necessary knowledge within the scope of their competencies. Having good communication skills is important for building a successful patient-nurse relationship. Effective communication reduces patients' fears, and fosters trust, and mutual respect, which ultimately gives patients more hope and confidence in their treatment (24). The primary goal of quality communication in diagnostic examinations, whether invasive or non-invasive, is to prepare the patient as thoroughly as possible, physically, psychologically, and spiritually. Echocardiography, both transthoracic and increasingly transesophageal, plays a significant role in monitoring and diagnosing heart conditions. Both methods have been steadily growing over the last decade, with rare complications. Educated medical staff is aware of potential complications related to the gastrointestinal, cardiovascular, and respiratory systems, as well as specific infections (25). Despite patients being continuously monitored, they should receive information about the examination procedure and potential complications. Informed consent, signed after the explanation, serves as both permission for the examination and confirmation that the patient understands its necessity and the potential complications. Patient information and the signed informed consent are primary strategies for preventing complications (26). When informing patients about the examination procedure and possible complications, it is essential to learn about the patient's medical history, fears, and concerns, which ultimately facilitates the examination process (26). However, certain limitations of this study should be noted. It was conducted in a single institution, so the results may not be generalizable. Furthermore, patients were referred to the study by healthcare

professionals who were the subject of the patients' assessment, which could have led to overly positive results. Also, some patients had previous experience with echocardiography, which might have influenced the study's outcomes.

Conclusion

The results of this research indicate that patients are well-informed and prepared for echocardiographic examinations. There is no significant difference in the awareness and preparation of patients for echocardiography based on gender and age. However, participants with a higher level of education agreed that they knew how the examination was performed before their appointment, in contrast to participants with lower education levels, showing a significant statistical difference between the groups (Kruskal-Wallis test, $p=0.02$). Participants who underwent transesophageal ultrasound of the heart reported being better informed and prepared than participants undergoing transthoracic ultrasound (Mann-Whitney U test, $p=0.01$). Every diagnostic procedure requires patient preparation and education, along with skill in conducting the procedure. Nurses and medical technicians play a vital role in preparing and educating patients for echocardiography. This highlights the need for continuous education and training for healthcare professionals to ensure patient awareness and safety.

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INFORMIRANOST I PRIPREMLJENOST PACIJENATA ZA EHOKARDIOGRAFIJU

Sažetak

Cilj. Ispitati informiranost i pripremljenost pacijenata za ehokardiografiju s obzirom na dob, spol, razinu obrazovanja i vrstu pretrage.

Ispitanici i metode. U presječnom istraživanju sudjelovali su pacijenti koji su dolazili na ehokardiografiju putem ambulante i kliničkih odjela Kliničkog bolničkog centra Osijek tijekom ožujka i travnja 2023. Kao instrument istraživanja o informiranosti i pripremljenosti pacijenata za ehokardiografiju upotrijebljen je anketni upitnik izrađen za potrebe ovog istraživanja.

Rezultati. U istraživanju je sudjelovalo 106 ispitanika, od kojih su 52 (49 %) muškarci te 54 (51 %) žene te ih je 51 % već bilo na jednoj do tri ehokardiografske pretrage. Ispitanici su u najvećem broju, njih 83 (78 %), informirani usmenim putem. Nema značajne razlike u informiranosti i pripremi ispitanika za ehokardiografiju s obzirom na spol i dob. Ispitanici s visokom stručnom spremom slažu se s tvrdnjom da su prije dolaska znali kako se pretraga izvodi, za razliku od ispitanika sa srednjom i nižom razinom obrazovanja, te postoji značajna statistička razlika između grupa ($p = 0,02$). Ispitanici koji su podvrgnuti transezofagealnom ultrazvuku srca naveli su da su informiraniji i pripremljeniji od ispitanika koji su podvrgnuti transtorakalnom ultrazvuku srca ($p = 0,01$).

Zaključak. Rezultati provedenog istraživanja ukazuju da su za ehokardiografske pretrage ispitanici dobro informirani i pripremljeni, nema značajne razlike s ob-

zirom na spol i dob. Ispitanici koji su obavljali transezofagealni ultrazvuk srca procjenjuju da su informiraniji i pripremljeniji u odnosu na one koji su obavljali transtorakalni.

Ključne riječi: ehokardiografija, informiranost, medicinska sestra, pacijent, pripremljenost
