Attitudes of Radiologic Technology Students Regarding the Role of the Radiologic Technologist in Percutaneous Coronary Interventions Teams

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ORIGINALNI ZNANSTVENI RAD

ATTITUDES OF RADIOLOGIC TECHNOLOGY STUDENTS REGARDING THE ROLE OF THE RADIOLOGIC TECHNOLOGISTS IN PERCUTANEOUS CORONARY INTERVENTIONS TEAMS

STAVOVI STUDENATA RADIOLOŠKE TEHNOLOGIJE O ULOZI RADIOLOŠKIH TEHNOLOGA U TIMU ZA PERKUTANU KORONARNU INTERVENCIJU

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SAŽETAK

Cilj: Koronarna bolest vodeći je uzrok smrti u Hrvatskoj, a perkutana koronarna intervencija (PCI) donijela je značajan napredak u njezinu liječenju. PCI izvodi interventni tim koji se sastoji od interventnog kardiologa, medicinske sestre i radiološkog tehnologa. Za postizanje preciznih i učinkovitih ishoda intervencije ključna je uloga radiološkog tehnologa u upravljanju dijaskopskim uređajem. Cilj rada bio je istražiti stavove studenata prijediplomskog stručnog studija radiološke tehnologije Fakulteta zdravstvenih studija u Rijeci o ulozi radiološkog tehnologa u specijalističkom timu tijekom PCI-ja i primjerenosti kompetencija stečenih tijekom sveučilišnog obrazovanja.

Materijali i metode: Istraživanjem su obuhvaćeni studenti svih triju godina redovitog prijediplomskog stručnog studija radiološke tehnologije, različitih sociodemografskih obilježja. Podaci su prikupljeni online putem upitnika izrađenog u Google obrascima i analizirani računalnim programom Statistica.

Rezultati: Većina ispitanika radiološkog tehnologa smatra nezamjenjivim u medicinskom timu tijekom PCI-ja, pri čemu se učinkovita komunikacija ističe kao ključni element za uspješan timski rad. Ispitanici, međutim, izražavaju uvjerenje da im obrazovni program ne pruža dovoljno znanja i vještina za kompetentno funkcioniranje unutar PCI tima, što ukazuje na potrebu za dodatnim obrazovanjem i stručnim usavršavanjem.

Zaključak: Studija pokazuje da studenti radiološke tehnologije shvaćaju značaj radioloških tehnologa u intervencijskom timu za PCI postupke, no izražavaju zabrinutost zbog nedostatnosti znanja i vještina stečenih tijekom studija za stručni rad u interventnim kardiološkim laboratorijima.

Ključne riječi: *koronarna bolest, intervencijska kardiologija, perkutana koronarna intervencija, radiološki tehnolog*

ABSTRACT

Aim: Coronary artery disease is a leading cause of death in Croatia, and percutaneous coronary intervention (PCI) has emerged as a significant advancement in its treatment. The facilitation of PCI is performed by an interventional team consisting of an interventional cardiologist, a nurse, and a radiologic technologist. In order to achieve precise and efficient intervention outcomes, the radiologic technologist's role in operating the fluoroscopy is crucial. This study's aim was to investigate the attitudes of undergraduate professional radiologic technology students at the Faculty of Health Studies in Rijeka regarding the role of the radiologic technologist within the specialist team during PCI and the adequacy of competencies acquired during university education.

Materials and methods: The research included students from all three years of regular undergraduate professional studies in radiologic technology, representing diverse demographic characteristics. Data were collected online through a questionnaire developed in Google Forms and analyzed using the Statistica software program.

Results: The majority of respondents view the radiologic technologist as essential in the medical team during PCI, with effective communication being emphasized as a crucial element for successful teamwork. However, respondents express a belief that their previous education has not equipped them with adequate knowledge and skills to function competently within a PCI team, indicating a perceived need for additional education and professional training.

Conclusion: The study shows that radiologic technology students comprehend the significance of radiologic technologists in the interventional team for PCI procedures. However, they express concerns regarding the insufficiency of knowledge and skills acquired during their studies for proficient work in interventional cardiology laboratories.

***Keywords**: coronary artery disease; interventional cardiology; percutaneous coronary intervention; radiologic technologist*

INTRODUCTION

Cardiovascular diseases (CVD) represent a significant global public health challenge, contributing significantly to morbidity, disability, and mortality worldwide (1). According to the World Cardiology Federation, CVD accounted for the loss of nearly 400 million disability-adjusted life years (DALYs) in 2019, with the economic burden disproportionately affecting both low- and high-income countries (2). CVD is responsible for approximately 20.5 million deaths globally annually, and this figure is projected to rise to 23 million by 2030 (3). About 4 million lives are lost annually in Europe due to CVD, and the European Union and other European countries bear a significant portion of this burden (3). Croatia also experiences a high incidence of CVD-related mortality, with CVD being the leading cause of death in the country. Croatia had 22,303 deaths in 2022 that were due to CVD, which was 39.1% of all deaths, making it one of the countries with a high risk of CVD-related mortality (3). It is alarming that about 20% of premature deaths before the age of 65 are caused by CVD, with coronary artery disease (CAD) being the main culprit (4). Percutaneous coronary intervention (PCI) has emerged as a pivotal advancement in treating CAD, offering a non-surgical method to alleviate coronary artery blockages using techniques such as balloon dilatation and stent placement (5,6). PCI, carried out in interventional cardiology laboratories, requires a specialized team consisting of an interventional cardiologist, perioperative nurse, and radiologic technologist (7). Effective coordination and expertise within this team are paramount for the success of PCI procedures, with the radiologic technologist playing a crucial role by operating fluoroscopy under the direction of the performing physician, aiding precise and efficient intervention execution.

The Undergraduate Professional Study in Radiologic Technology should equip students with the necessary competencies and theoretical understanding to function within interventional cardiology laboratories upon graduation. Given the critical contributions of each team member in PCI procedures, it is essential for students to master the requisite knowledge during their studies to participate effectively in these complex interventions, often critical for patient outcomes.

This paper aims to explore the perspectives of students enrolled in the Undergraduate Professional Study of Radiologic Technology at the Faculty of Health Studies in Rijeka (Croatia) regarding the role of the radiologic technologist within the specialist team during PCI and the adequacy of competencies acquired during their university education. Such insights can be used to improve the quality of their academic experience by enhancing their competencies, refining educational approaches, and ultimately improving their overall academic experience.

MATERIALS AND METHODS

Participants

The study was conducted at the Faculty of Health Studies, University of Rijeka, in February 2024. The study included 56 students enrolled in the full-time Undergraduate Professional Study of Radiologic Technology, representing all academic years, genders, and varying age groups. The participation was voluntary and anonymous.

Methods

Data were collected using a specially designed questionnaire created in Google Forms tailored to the research objectives. The questionnaire consisted of three sections. The questions, including age, gender, year of study, and completion of high school education, were used in the introductory section to gather sociodemographic information. The second section consisted of eight questions aimed at assessing respondents' perspectives on the significance of the radiologic technologist's role within the medical team during PCI. The third section consisted of six questions regarding the respondents' views on the sufficiency of knowledge and skills about PCI obtained during their Undergraduate Professional Study of Radiologic Technology education at the Faculty of Health Studies, University of Rijeka.

Ethical aspects

The University of Rijeka's Ethics Committee approved the study, which ensured it adhered to the strict standards outlined in Croatia's Personal Data Protection Act (Official Gazette 103/03–106/12). Furthermore, the ethical principles stated in the Declaration of Helsinki were strictly observed during the research process. Before participating, all respondents received comprehensive information about the study's aims and objectives. Each participant was given the opportunity to express their voluntary consent, emphasizing their autonomy to participate or withdraw without coercion. Participation was strictly voluntary, emphasizing the principles of ethical research conduct.

Statistical analysis

The collected data were inputted into an Excel spreadsheet and analyzed using the statistical software Statistica, version 14.0.0.15 (TIBCO Software Inc.). Sociodemographic characteristics of the respondents, including gender and completed high school education (nominal variables), as well as age and year of study (ordinal variables), were analyzed using descriptive statistical methods.

The independent variables consisted of questions regarding the respondents' perspectives on the role of the radiologic technologist within the specialist team during PCI, as well as the sufficiency of the knowledge and skills acquired during their studies to perform PCI. Based on their responses, these questions were categorized into dichotomous variables (YES/NO options).

The Kolmogorov-Smirnov statistical test was used to assess the distribution of student responses to both sets of questions revealing non-normal distributions (p0.05). For each question, a descriptive analysis of responses, including absolute frequencies, was carried out.

RESULTS

The sociodemographic characteristics of the respondents are listed in the Table 1. This research involved 56 students from the Undergraduate Professional Study of Radiologic Technology at the Faculty of Health Studies, University of Rijeka.

Table 1. Sociodemographic characteristics of the respondents

Sociodemographic characteristics	N (%)
Gender	
Male	11 (19.6%)
Female	45 (80.4%)
Age (years)	
18	3 (5.4%)
19	15 (26.8%)
20	18 (32.1%)
21	10 (17.9%)
22	9 (16.1%)
23	1 (1.8%)
Academic year	
1st	19 (34%)
2nd	19 (34%)
3rd	18 (32%)
Previous education	
General high school	42 (75.0%)
Health or medical high school	13 (23.2%)
High school with a non-health-related focus	1 (1.8%)

The survey had 56 participants, with 45 of them being female students (80.4%) and 11 of them being male students. The participants varied in age, between 18 and 23 years (Med=20, Mod=18). In regards to the academic year, they were almost equally divided between the initial year of study, the second academic year, and the third year of education. Regarding high school education, 42 respondents graduated from general high school (75%), 13 graduated from health or medical high school (23.2%), and one graduated from a high school with a non-health-related focus (1.8%).

The questionnaire was completed by all respondents, who answered the items presented in the Table 2.

Students' views on the role of a radiologic technologist.

Table 2 presents respondents' views on the importance of the radiologic technologist's role during PCI, as assessed through a series of questions. The vast majority of respondents, N= 54 (96.4%), expressed the belief that a radiologic technologist is a necessary member of the medical team for PCI procedures, while only 2 respondents (3.6%) disagreed.

All respondents (N=56;100%) unanimously affirmed the importance of the radiologic technologist's role during PCI procedures.

Regarding the perceived importance of the radiologic technologist's role compared to other team members during PCI, 52 respondents (92.9%) believed that the technologist's role is equally crucial as that of other members. In contrast, a minority of 7.1% of respondents held a different view.

Similarly, the majority of respondents, N=52 (92.9%), indicated that the knowledge and skills of the radiologic technologist have an equal impact on the outcome of PCI compared to other team members, with 7.1% of respondents disagreeing.

All respondents (N=56; 100%) acknowledged the critical importance of teamwork in the context of PCI procedures.

Regarding the appreciation of the radiologic technologist's work of other team members, 35 (62.5%) respondents felt that the technologist's work is undervalued, while 21 (37.5%) believed otherwise.

All respondents (N=56; 100%) emphasized the importance of communication among team members during PCI procedures.

In terms of overall appreciation of the radiologic technologist by other team members, 47 (83.9%) respondents felt that the technologist is adequately valued, while 9 (16.1%) disagreed.

These findings provide insights into the perceptions of radiologic technology students at the Faculty of Health Studies, University of Rijeka, regarding the role and appreciation of radiologic technologists within the medical team during PCI procedures.

Students' attitudes toward the knowledge about percutaneous coronary intervention acquired during their studies

The following six questions were utilized to explore respondents' perspectives on the competencies acquired through their education in the Undergraduate Professional Study of Radiologic Technology at the Faculty of Health Studies, University of Rijeka, for their roles within the interventional cardiology team during PCI.

All respondents indicated that they did not acquire sufficient knowledge and skills necessary for performing PCI during their previous education. A vast majority of respondents (N=52; 92.9%) expressed the belief that they do not acquire enough knowledge and skills necessary for performing PCI during professional practice. Only a minority (N=4; 7.1%) felt that this professional practice adequately prepared them to work in a team for PCI.

The majority of respondents (N= 53; 94.6%) agreed on the necessity of additional education and professional training to participate effectively in a team during PCI, while a small percentage (5.4%) held an opposing view. Regarding the suf ficiency of knowledge about the role of a radiologic technologist during PCI, 37 (66.1%) respondents believed that they could obtain enough knowledge through teaching courses to participate in the PCI. Conversely, 29 (33.9%) respondents disagreed.

A significant number of respondents (N=36; 64.3%) confirmed that they had the opportunity to stay in an interventional cardiology laboratory, while 30 (35.7%) had not yet had this opportunity.

The majority of students (N= 39; 69.6%) envisioned their future workplace in the cath lab, while 17 (30.4%) expressed a different preference.

Table 2. Descriptive statistics for questionnaire items expressed in percentages

PARTICLES FROM QUESTIONNAIRES	YES(%)	NO(%)
Students' views on the role of a radiologic technologist		
1. Does the radiologic technologist participate in the medical team for percutaneous coronary intervention?	96.4	3.6
2. Do you believe the radiologic technologist plays a significant role in percutaneous coronary intervention?	100	/
3. Do you think the role of the radiologic technologist is equally important as that of other medical team members during percutaneous coronary intervention?	92.9	7.1
4. Do you think that the knowledge and skills of the radiologic technologist equally affect the outcome of percutaneous coronary intervention as the knowledge and skills of other medical team members?	92.9	7.1
5. Do you believe that teamwork is essential for percutaneous coronary intervention?	100	/
6. Do you think there is a lack of appreciation for the work of the radiologic technologist by other medical team members during percutaneous coronary intervention?	62.5	37.5
7. Do you believe communication among medical team members during percutaneous coronary intervention is crucial?	100	/
8. Is it your belief that the radiologic technologist is treated with respect by other medical team members in the interventional cardiology laboratory?	83.9	16.1
Students' attitudes toward the knowledge about percutaneous coronary intervention during their studies		
1. Do you feel that your education has given you enough knowledge and skills to work reliably as a member of a percutaneous coronary intervention team?	/	100
2. Did you acquire the necessary knowledge and skills during your professional practice during the study to work reliably as a member of the percutaneous coronary intervention team?	7.1	92.9
3. Do you believe extra education and professional training are necessary as a member of the percutaneous coronary intervention team?	94.6	5.4
4. During your previous education, have you taken teaching courses about the role and duties of a radiologic technologist during percutaneous coronary intervention?	66.1	33.9
5. During your professional practice, have you had the opportunity to work in the interventional cardiology laboratory?	64.3	35.7
6. Do you see yourself in a future position as a radiologic technologist at the laboratory for interventional cardiology?	69.6	30.4

These findings illuminate the perceived adequacy of education and training among radiologic technology students for their prospective roles within the interventional cardiology team during PCI procedures.

The results of the Kolmogorov-Smirnov statistical test indicated a non-normally distributed distribution of respondents' answers to both groups of questions regarding their attitudes ($p<0.05$). Consequently, descriptive analysis of answers, including absolute frequency, was utilized for each question, and the differences were tested based on the proportion of responses relative to the total number of answers.

Table 3 summarizes the findings, demonstrating that the majority of students exhibited a positive attitude toward the importance of radiologic technologists within the interventional radiology team (Mean = 7.29; Standard Deviation = 0.76). However, it is noteworthy that most students (Mean = 3.04; Standard Deviation = 1.10) expressed the belief that their college education did not adequately equip them with the requisite knowledge and skills necessary for work in the invasive cardiology laboratory during PCI.

Table 3. The results of descriptive statistics for each group of questions (Total Group 1, Total Group 2) (mean – arithmetic mean; med – median; mode – most common value; min – minimum value; max – maximum value; SD – standard deviation)

Variables	Mean	Med	Mod	Min	Max	SD
Total Group 1	7,29	7,00	8	5	8	0,76
Total Group 2	3,04	3,00	4	1	5	1,10

These results underscore the perceived importance of radiologic technologists in the interventional radiology team while also highlighting concerns regarding the sufficiency of education and training for work in the invasive cardiology laboratory during PCI among students.

DISCUSSION

The care of patients with CAD has reached a turning point due to PCI (8). The intervention's success is primarily determined by the competence and collaboration of the entire interventional cardiology team. Each team member contributes to the success of the procedure by complementing each other. Therefore, the radiologic technologist is a valuable and indispensable team member.

The first group of questions examined the attitudes of undergraduate radiologic technology students regarding their role in the interventional cardiology team during the performance of PCI. The majority of students have a positive view of the role of the radiologic technologist when performing PCI, as shown by this research. According to the majority of respondents, a radiologic technologist is necessary for the medical team to perform PCI, which is in line with the findings of earlier studies (9). These findings are consistent with the results of the research conducted in 2019 by Bilić, which emphasizes the particularly important role of the radiologic technologist in managing radiological equipment (fluoroscopy) during PCI (10). Previous research results agree that the role of all team members is equally important, which was also confirmed by the results of this research; 93% of all respondents believe that the role of the radiologic technologist is equally important as the role of other medical team members when performing PCI (11). Namely, the knowledge and skills of the radiologic technologist equally influence the outcome of percutaneous coronary intervention, supplementing the knowledge and skills of other medical team members, as discussed by Brunetti and colleagues (11). Nevertheless, the majority of surveyed students (62.5%) believe that the work of a radiologic technologist in the interventional cardiology team is not sufficiently appreciated, which contrasts with the results of Bilić's research. The cause of such attitudes may be students' insufficient experience, considering that part of the students did not participate in the performance of PCI during their previous studies or professional practice (9). This finding emphasizes the importance of adequate and intensive communication between members of the interventional cardiology team during PCI. On the one hand, this ensures the success of the procedure, but at the same time, it develops the confidence and competence of the radiologic technologist, especially if the patient is included in the communication (12, 13).

The second group of questions examined the quality of education during the undergraduate professional radiologic technology study at the Faculty of Health Studies, University of Rijeka. The aim was to assess the level of knowledge and set guidelines for improving the study quality. The majority of students believe that during their college education, they do not acquire knowledge and skills that would be sufficient to work in the laboratory for invasive cardiology during the performance of PCI. The results published by Matijaš in 2016 are in contrast to these results (14). The cause of such conflicting views is certainly worth considering. The research that was mentioned was carried out in various academic institutions, particularly universities in Croatia. Although the educational programs of radiologic technologists are harmonized at the level of the entire country and are in accordance with the educational programs of the European Union, the implementation of these programs depends on each individual educational institution. The results obtained support the fact that the education of future radiologic technologists in the field of PCI at the Faculty of Health Studies in Rijeka is of poorer quality compared to that at other faculties (15). The reason may be due to the fact that the previous research was carried out 8 years ago. Our findings suggest that the quality of education for radiologic technology students specializing in invasive cardiology at the Faculty of Health Studies in Rijeka is insufficient. The fact that as many as 93% of respondents believe that students do not acquire the knowledge and skills necessary to participate in PCI procedures during their professional practice reflects negatively on the quality of training of radiologic technologists for specific procedures. Although these results also contradict the results of Matijaš's research, they once again draw attention to the need to continuously improve the quality of teaching, both theoretical and practical. The respondents themselves are aware of this need, as 67% of them believe that they need additional education and professional training to perform PCI. Professional associations recommend continuous education, and this is in line with their recommendations (16). Furthermore, just 64% of the surveyed students were given the chance to stay in an interventional cardiology laboratory during their professional practice. Certainly, this result is a consequence of the inclusion of students from different academic years in this study. Namely, some of the respondents have not yet started professional practice, which enables them to have a close encounter with the laboratory for interventional cardiology and to form a sense of security in their work (17,18). However, communication between students and the transfer of information, especially if it is negative, can cause students' insecurity and limit their self-confidence for future work (19). Despite this, as many as 70% of respondents consider working in an angio-room desirable for their future workplace, which is in line with the results of a survey conducted in 2020 by Mihelčić (20). There is no doubt that student education should be continuously improved. In addition to the necessary professional practice, the traditional teaching method needs to be enriched with modern teaching strategies that include the application of computer simulations and the use of various virtual aids (17,21). This arouses greater interest and active involvement of students in classes, develops self-confidence, and improves competencies for future work in the interventional cardiology laboratory during PCI (22,23).

CONCLUSION

The role of the radiologic technologist within the interventional cardiology team, particularly in procedures like PCI, cannot be overstated. Their expertise in imaging technologies and active participation during PCI procedures are invaluable for ensuring accurate and safe outcomes for patients.

However, despite their crucial role, the recognition of radiologic technologists within the healthcare community sometimes falls short. It is imperative to advocate for the promotion and acknowledgment of their role as equal and inseparable members of the interventional cardiology team.

One way to enhance recognition is through education. Continuing professional development programs can be implemented to ensure that radiologic technologists stay abreast of the latest advancements in imaging technologies and procedural techniques relevant to interventional cardiology. Emphasizing practical, hands-on training, supplemented by modern teaching methods, can further enhance their skills and confidence in their roles.

Moreover, collaboration with other healthcare professionals, including cardiologists, nurses, and administrators, can help raise awareness of the vital contributions of radiologic technologists in PCI procedures and other interventional cardiology interventions.

By investing in ongoing education, promoting interdisciplinary collaboration, and advocating for recognition, we can ensure that the essential role of radiologic technologists in interventional cardiology is duly acknowledged and appreciated within the healthcare community. This recognition ultimately translates into improved patient care and outcomes.

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