Original Article
doi: https://doi.org/10.1590/1983-1447.2022.20210079.en

The performance of the nursing team in outpatient radiology and diagnostic imaging services

A atuação da equipe de enfermagem em serviços ambulatoriais de radiologia e diagnóstico por imagem

La atuacción del equipo de enfermería en los servicios ambulatorios de radiología y imágenes diagnósticas

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How to cite this article:
Acauan LV, Seda JM, Silva SCSB, Paes GO, Trotte LAC, Stipp MAC. The performance of the nursing team in outpatient radiology and diagnostic imaging services. Rev Gaúcha Enferm. 2022;43:e20210079. doi: https://doi.org/10.1590/1983-1447.2022.20210079.en

ABSTRACT

Objective: To know the performance of nursing professionals in accredited outpatient radiology and diagnostic imaging services.
Methods: Exploratory, qualitative study, conducted in January 2019, through interview with 21 coordinators in three outpatient imaging services in the Southeast region of Brazil. A textual corpus was formed and processed by a software and the data was analyzed using Reinert's method.
Results: After the organization of the content, two thematic blocks were elaborated: nursing assignments when assisting imaging exams, with three classes with similar content; and nursing and patient safety in radiology, with two classes with similar content.
Conclusion: Nursing had a relevant role in quality management, developing actions to mitigate risks and damages, recording and managing adverse events and acting in educational processes, focusing on the quality of care and of images from the perspective of patient safety.
Keywords: Radiologic and imaging nursing. Nursing, team. Nurse's role. Nursing care. Diagnostic imaging.

RESUMO

Objetivo: Conhecer a atuação da enfermagem nos serviços ambulatoriais de radiologia e diagnóstico por imagem acreditados.
Métodos: Estudo exploratório, qualitativo, realizado em janeiro de 2019, através de entrevistas com 21 profissionais coordenadores em três serviços ambulatoriais de imagem na região Sudeste. Formou- se um *corpus* textual processado por um *software* e a análise dos dados ocorreu por meio do método de *Reinert.*
Resultados: Foram produzidos dois blocos temáticos a partir da organização do conteúdo: atribuições da enfermagem na assistência aos exames de imagem, onde três classes emergiram de conteúdo similar e o outro bloco, a enfermagem e segurança do paciente na radiologia formados por duas classes que demonstraram temáticas análogas.
Conclusão: A enfermagem teve uma atuação relevante na gestão da qualidade, executando ações para mitigação dos riscos, registrando e gerenciando eventos adversos; atuando em processos educativos, focando na qualidade do atendimento e das imagens na perspectiva da segurança do paciente.
Palavras-chave: Enfermagem radiológica e de imagem. Equipe de enfermagem. Papel do profissional de enfermagem. Cuidados de enfermagem. Diagnóstico por imagem.

RESUMEN

Objetivo: Conocer la atuacción de la enfermería en los servicios ambulatorios de radiología e imágenes diagnósticas acreditados.
Métodos: Estudio exploratorio, cualitativo, realizado en enero de 2019, a través de entrevista con 21 profesionales coordinadores en tres servicios de imágenes ambulatorios en la región sureste. Se formó un *corpus* textual que fue procesado por un *software*, compatible con el análisis de los datos, a través del método *Reinert*.
Resultados: A partir de la organización del contenido se produjeron dos bloques temáticos: atribuciones de enfermería en asistencia a exámenes de imagen, donde surgieron tres clases con contenido similar; otro bloque, enfermería y seguridad del paciente en radiología, formado por dos clases que demostraron temas similares.
Conclusion: La enfermería actuó en la gestión de la calidad, reduciendo riesgos, registrando y manejando eventos adversos, actuando en los procesos educativos, con calidad en la atención y imágenes, desde la perspectiva de la seguridad del paciente.
Palabras clave: Enfermería radiológica y de imágenes. Grupo de enfermería. Rol de la enfermera. Atención de enfermería. Diagnóstico por imagen.

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INTRODUCTION

One of the ways that society recognizes nursing care actions is through interventions to meet care needs, which have been recognized as specialized activities necessary for society since the second half of the 19th century. Since then, the expansion of nursing practice settings began to require special training and production of knowledge to support professional actions[1–2].

As part of this expansion, care settings associated with the technological evolution in outpatient radiology and diagnostic imaging services (SRDIA) require safe and quality care, in a specialty that is constantly evolving[3].

The role of nursing in this care specialty is recognized as "nursing in diagnostic imaging – radiology and imaging" and was recognized by the Federal Nursing Council (COFEn) in Resolution 625/2020[4].

The name of the specialty is related to imaging tests that use ionizing radiation, known as x-ray, computed tomography (CT) test and tests that do not use radiation, such as magnetic resonance imaging (MRI) and ultrasound (US).

There is still a combination of anatomical and functional imaging methods, imaging techniques that use nuclear medicine equipment, such as positron emission tomography (PET) and, very recently, a hybrid technology of PET and magnetic resonance imaging (MRI). Different drugs can be used when applying these methods, such as contrast agents and radiopharmaceuticals. All this complex technological evolution justifies the nomenclature given by COFEn to this new nursing specialty[4,5].

Currently, disseminating this specialty and producing knowledge, as well as the methodology of nursing accreditation in this space, are challenges that require attention, as they are associated with the redefinition of the roles of nursing professionals and other members of the health team in the SRDIA[6].

Due to technological evolution, the risks and limitations involved in imaging tests and the recognition of their importance for all health specialties, and with the objective of stimulating the improvement of quality and safety in imaging services, in 2015, the Brazilian College of Radiology and Diagnostic Imaging (CBR), the official representative of the specialty of Radiology and Diagnostic Imaging, created the Accreditation Program in Diagnostic Imaging (Padi). This program has been recognized by the National Supplementary Health Agency (ANS) since 2016 and, since 2017, it has been annually certified by the International Society for Quality in Health Care (ISQua), the world authority in the certification of entities linked to quality improvement[7].

In accredited imaging services, understanding that quality improvements are continuous results in good care practices among administrative and assistance workers. When supported by management, these practices can increase the quality, safety and productivity of exams, meeting the expectations of patients, of the multi-professional healthcare team and of the administrative team, while also adding value to the service[8].

In the perspective of this study, the multidisciplinary administrative team in the SRDI is composed of professionals who develop their activities in coordination, in the quality sector and in service/reception and scheduling, while the healthcare team is composed of radiology technicians (professionals specialized in radiological techniques), biomedical scientists/MRI specialists, physicians and nursing professionals who add values and encourage good radiological practice, with skills to observe, evaluate and execute evidence-based actions[2].

Nursing professionals have an important role in the accreditation process, which demands active participation in decision-making, strategic and operational processes. Currently, this participation is deficient in the SRDIA, perhaps because the nursing specialty of radiology and imaging is not very common and is not an important focus point during academic training, which contributes to the lack of knowledge of many professionals about this care specialty[6].

That said, this study is innovative as it promotes a discussion about nursing care in a work environment that is still little disseminated and studied, based on the following guiding question: How is nursing perceived by the leaders of multidisciplinary healthcare and administrative teams of outpatient radiology and diagnostic imaging services accredited by Padi? This study aimed to understand the role of nursing professionals in accredited outpatient radiology and diagnostic imaging services.

METHOD

This is a qualitative, descriptive exploratory study using Bardin's thematic analysis. The study was carried out in three private outpatient services specialized in radiology and diagnostic imaging and accredited by Padi, located in three cities in the Southeast region of Brazil, with approximately six thousand consultations per month and with an average of sixty employees.

The same imaging exam methods were available: X-ray, Magnetic Resonance Imaging (MRI), Computed Tomography (CT), Mammography, Bone Densitometry (DXA) and Ultrasonography (USG). The services were open from 7

am to 7 pm, from Monday to Friday and from 7 am to 1 pm on Saturdays.

The participants of this study were all seven leaders (coordinators) of the multidisciplinary health and administrative teams in each setting, as the opinion of the teams with which nursing professionals interact is essential for achieving the objectives. There were twenty-one (21) professionals from the following teams: quality management, reception, scheduling, medical, nursing, radiological and biomedical technicians, and an administrative director.

The inclusion criteria for this study were being a leader or coordinator of the sector, according to the name given by the imaging services, and having participated in an accreditation process. Exclusion criteria were coordinators of sectors of outsourced services, such as information technology, and coordinators who did not participate in the accreditation process for any reason in the six months prior to the external audit.

Data was collected in January 2019 through semi-structured interviews with three open questions elaborated by the researchers of this study. The interviews were conducted by a researcher and applied equally to all participants. There was no data saturation, since all the statements were transformed into texts to be processed by the *software*. The interviews were carried out in each setting separately and supported by the Consolidated Criteria for Reporting Qualitative Research (COREQ)[9].

The pilot test of the data collection instrument was applied in an SRDIA with the same characteristics of the settings of this study, in the South region of the country.

Each interview lasted between 40 and 60 minutes and was recorded in a reserved place in the services, individually, during the professionals' working hours, according to prior appointment with each participant. All participants signing an Informed Consent Term (TCLE). They were identified by numbers from 1 to 21, followed by the work developed by each participant, by the following letters: QC- quality coordinator; NC- nursing coordinator; MC- medical coordinator; CCT/MR- coordinator of tomography and resonance; CSC- customer service coordinator; RAC – radiology coordinator; CR- reception coordinator; SC – Scheduling Coordinator and MaC – management coordinator. The recordings of the interviews will be stored with the researchers for a minimum period of five years, and, after that, they will be destroyed as required by law.

After transcription, all interviews were read, organized, and transformed into text, which is called *corpus,* according to the requirements of the IraMuteq® software, which was used as a tool to support the analysis of data in this study.

The Descending Hierarchical Classification (DHC) was used for the textual analysis of the corpus. This method was proposed by *Reinert* in 1990 and uses statistical calculations on the qualitative variables of the texts, overcoming the dichotomy between quantitative and qualitative analysis[10].

The DHC classifies the text segments (TS), which are excerpts from the interviews, according to their vocabularies, grouping them based on the association and frequency of the reduced forms, and if this association is not completed, the use of the TS is changed, varying the percentage presented by the *software*. Thus, the classes are formed and can be read from left to right, descending according to *subcorpus* (branches), going from the classes with the highest amount of TS to the classes with the lowest, according to the Dendogram produced by the *software* (Figure 1).

After processing the *corpus* with 21 texts (21 interviews), the *software* obtained 246 TS and of these, 195 continued under analysis, using 79.27% of these ST. These TS were grouped into vocabulary correlated by content, theme, and similarity, in a hierarchical scheme, and formed five lexical classes that were considered stable, that is, they were composed of TS with similar vocabulary.

The criteria for selecting the lexical content in the CHD was the frequency and the highest chi-square (x^2) values of the words in each class (Figure 2). The chi-square test is used to verify the association between the TS words and their respective class; therefore, the higher the value, the greater the association.

All words selected had a probability of occurrence greater than 3.84 and $p<0.001$ (x^2 distribution), indicating a significant association with the class. For the analysis, the TS associated with each class were included, which allowed obtaining the context of the statistically significant words, enabling a more qualitative analysis[10].

This study was approved by the Research Ethics Committee under protocol 2.741.055 and CAAE nº 91400518.9.0000.5238. The confidentiality of the participants was ensured, following resolution 466/12 of the National Health Council (CNS).

RESULTS AND DISCUSSION

The Dendrogram (Figure 1) produced *by IraMuteq®* divided the *corpus* into two *subcorpus*, as evidenced by the two ramifications, demonstrating that classes 4, 3 and 5 with 40 TS – 20.5%, 48 TS – 24.6% and 31 TS – 15.9% respectively, referred to a theme, while the classes 1 with 35 TS 17.9% and class 2- 41TS-21% referred to a different one (the software's mathematical rounding may present a difference of 0.1%). Therefore, despite their differences, classes 4, 3 and 5 had

similar content and, in the same way, classes 1 and 2 referred to similar themes. This way, we decided to the discuss the classes in two groups, referred to as thematic block (TB) 1 and thematic block 2.

After the identification of the lexical content of each of the classes that form the TB and their factorial representation expressed in Figure 1, we named it as: Thematic Block 1- Nursing assignments when assisting imaging exams (Classes 4, 3 and 5) and Thematic Block 2- Nursing and patient safety in radiology (Classes 1 and 2).

For a better understanding and visualization of the classes that form the TB, Figure 2 shows the evoked word, the frequency (f) of the number of TS that include the word at least 1 time in the class, and the frequency of the chi-squared test (x^2).

Thematic block 1- Nursing assignments when assisting imaging exams

Nursing professionals, with the close collaboration of the leaders of multidisciplinary teams in the accredited imaging services, aim to reduce and prevent any type of harm to the patient through risk management, ensuring that policies, guidelines and protocols are complied and offering suggestions for more effective improvements[11,12].

According to the statement below, it was understood that the nursing team was recognized for actions that are relevant to risk management and technical procedures, such as venipuncture for intravenous administration of contrast medium (CM) and other drugs, contributing for improvement.

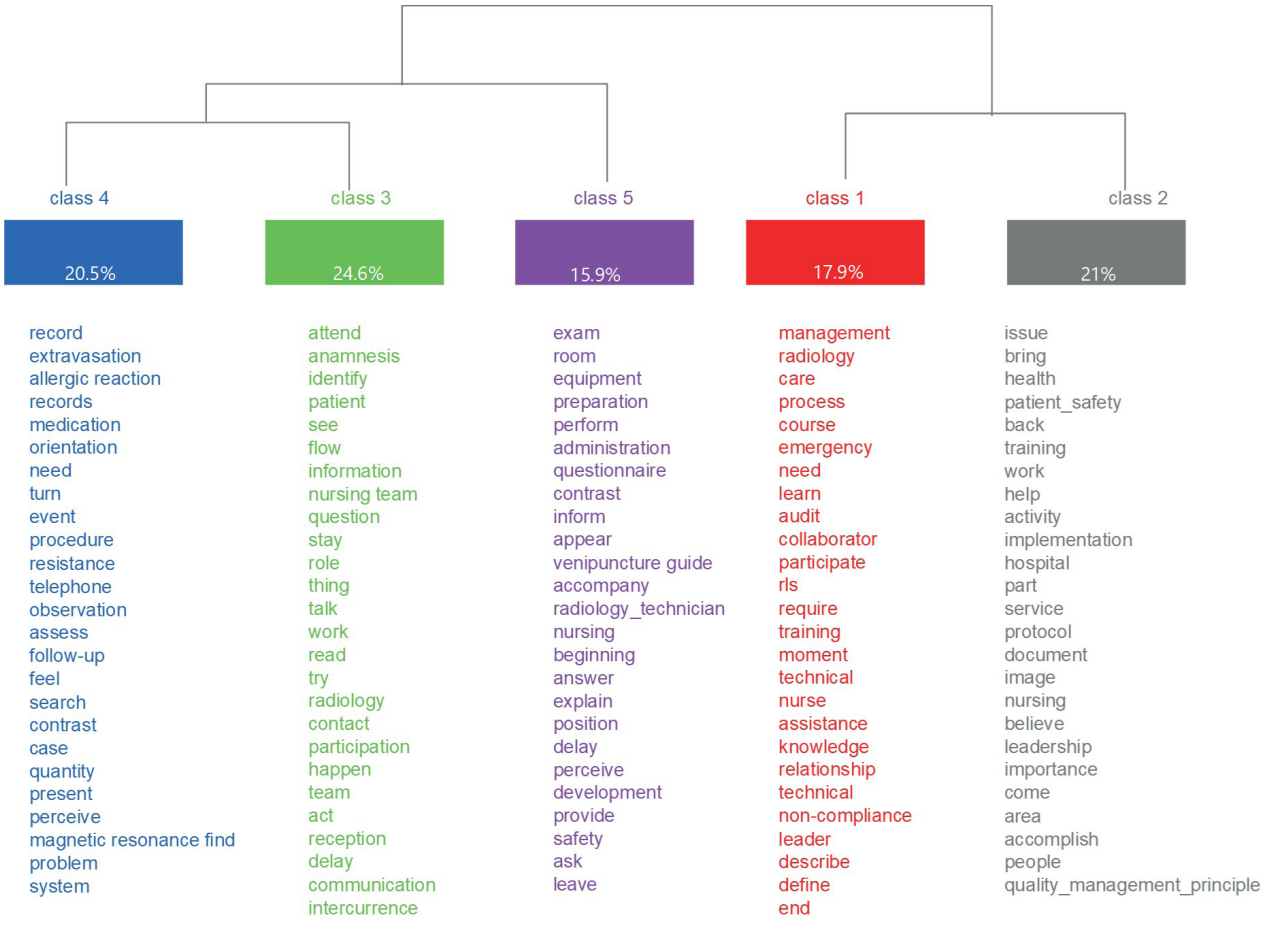

Figure 1 – Dendrogram of the Descending Hierarchical Classification. Rio de Janeiro, Rio de Janeiro, Brazil, 2020
Source: Study data, 2020.

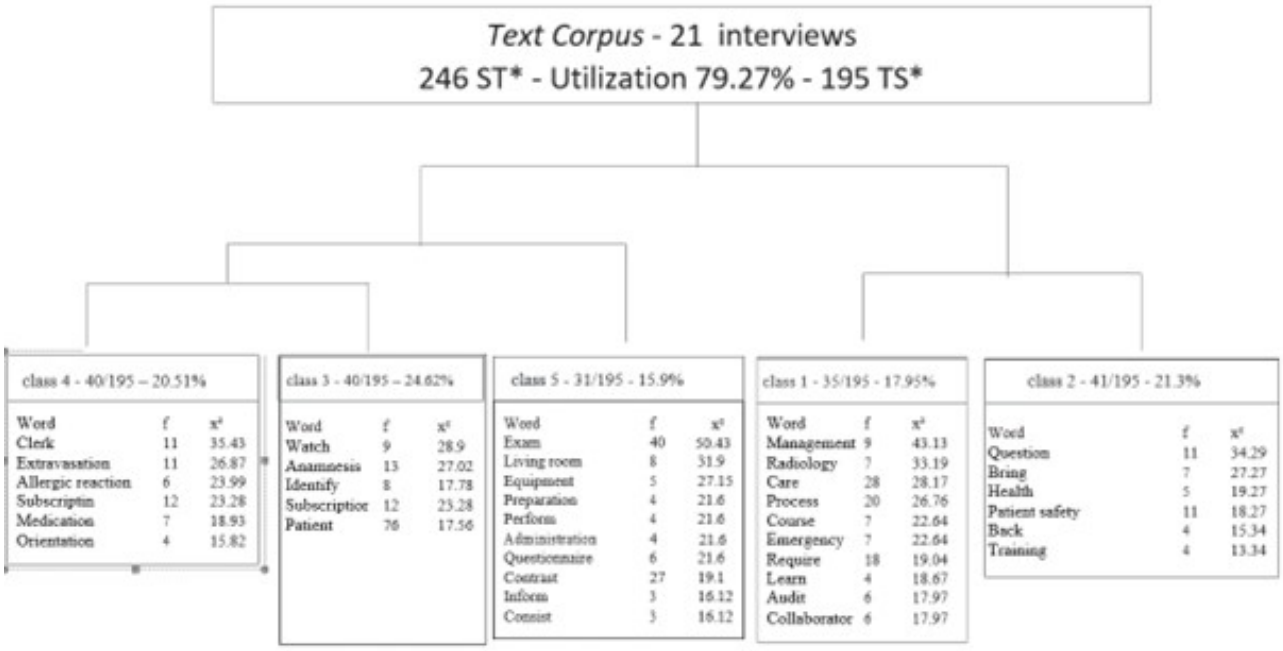

Figure 2 – Representation of the formation of classes. Rio de Janeiro, Rio de Janeiro, Brazil, 2020
*TS= Text segment; †f=Frequency; ‡x^2= Association
Source: Study data, 2020.

> [...] *the nursing team in diagnostic imaging collects history, fills out allergy questionnaires looking for risk factors, collects information about patients, nursing professionals multitask, they also do the venipuncture for the administration of the contrast* (E18-NC).

For the implementation of risk management, recording adverse events (AEs) is essential to prevent future damage according to the content apprehended. It was demonstrated that "recording" is a relevant nursing assignment in the SRDIA. The nursing team is also responsible for knowing the risks related to the use of CM, a drug that is used in some tests and requires a peripheral venous puncture. To prevent possible damage, nursing professionals select the caliber and shape of the catheter and the location of the vein to increase the probability of success. The choice of a large caliber venous catheter is relevant because, depending on the exam, a higher flow (5mL/per second) and a greater amount of the drug may be required [3,13].

Despite their multiple benefits to the patient, radiological methods, techniques, and procedures involve risks. Therefore, the search for a quality care has made management and care teams work together in pursuit of these goals, resulting in a different nursing action in accredited imaging services. The management model must plan, decide, organize, and control the provision of assistance, which can be done through actions such as recording, analysis, evaluation and monitoring of risks and AEs.

A nursing team that knows and monitors each patient, as well as the operation of the service, aiming to implement good practices to prevent health damage, plays a vital role within the professional team. This demonstrates the importance of recording AEs, which, in many cases, are considered preventable, even with their different levels of severity[13], as expressed in the following statement:

> [...] *it is important to have a record of allergic reactions to contrast, because we send it to the contrast supplier to check that batch; the traceability of the batch with problems for investigation, this is one of the reasons for recording it* (E12- CCT/MR).

Some imaging tests require the use of contrast to differentiate tissues with similar characteristics, such as muscles and blood vessels.

Iodinated contrast media (ICM) and gadolinium, which are administered intravenously in the CT and in the MRI, respectively, are chosen for their ability to absorb X-rays or for their magnetic properties. After determining the contrast, the volume and form of injection must be established for a good image visualization.

I think nursing is to be congratulated, because if you don't have a nursing professional... I'll give you an example, we have a very intense schedule here, in the sense of having several complex exams, and most or all exams depend on the contrast, on the administration of the contrast. So you have to have a really good team, a team that is good in treating patients, as we get a lot of debilitated patients, a lot of phobic patients, who can't do the exam. I see that the nursing team today is much more helpful with the patient, they are concerned with the risks before the exam, they do the anamnesis carefully, which was a deficit we had before. (E16- SC).

The contrast cited in the statements above refer to both ICM and gadolinium administered intravenously in the CT and the MRI, and represent the greatest concern in the and follow-up, as they are associated with the possibility of developing reactions and AEs[2].

Allergic reactions to the administration of CM, also considered an adverse reaction (AR), are increasingly frequent, either due to the increase in the use of contrast in clinical practice or to the better identification of cases through the records of these reactions and AEs. Recording the occurrence with information that identifies the drug involved is a strategy that makes the use of this drug safer through its traceability, which corroborates the understanding expressed by the participant.

The traceability of the CM mentioned by the deponent is relevant, as the drug involved in the event can be identified by their batch number, series and validity and controlled through the National Drug Control System, created by the National Health Surveillance Agency (ANVISA), allows its control. This system allows the monitoring of any other drug and health supplies for the demands of authenticity, origin, validity, commercialization, distribution, administration, among others[14].

The system of notification to ANVISA allows any professional, individual and health service to register information about events related to medication, equipment, technology, and other health products. Accredited SRDIA are obligated to be registered in the Health Surveillance Notification System (NOTIVISA)[7,15].

In specific cases of patients with a previous allergic reaction to ICM, there may be a five times greater risk of a future allergic reaction if exposed to the same cm. In allergies to crustaceans and povidone-iodine, the risk is increased by two or even three times. Even so, the use of premedication in imaging services is not justified[16].

In addition to allergic reactions, contrast extravasation is another risk that threatens patient safety and must be monitored, as shown below. As explained by the participant, the methodology of the Padi requires the management of the contrast extravasation indicator, as a way of improving operational practices. The participant understood that keeping a record of the actions carried out by nursing professionals was relevant for producing the indicator.

[...] *there is an indicator of extravasation of contrast required by Padi, so that this event can be identified and followed up, so recording the event is important* (E11- CSC).

The mandatory indicator in services accredited by Padi aims to monitor extravasation as an opportunity to develop quality improvement actions, with preventive measures that minimize this occurrences according to the reality of each service[7].

The following participants recognize the importance of nursing in this specialty, being part of administrative leadership.

[...] *for the administration of contrast, you must have a really good nursing team that is technically efficient in patient care, as we have a lot of debilitated patients* (E16-CAg).

Nursing is one of the most difficult sectors, there is the quality of medication control, which is complicated, keeping the rooms tidy, with everything in order, and there is a lot of care and quality protocols to check. Nursing in diagnostic imaging collects the patient's history, fills out a questionnaire to search for risk factors for allergy to contrast. Lots of information, multitasking; it's not just doing vein punctures, putting the patient in the exam room, on the exam table, following the contrast injection and then taking them out. (E20-CM)

In the SRDIA, the careful preparation of the venipuncture performed by nursing is essential to minimize the risk of extravasation. In addition, there are maneuvers that can be performed to confirm the intravenous location of the catheter inserted in the peripheral vein, since the CM can be introduced at increased speed. The injection of contrast must be monitored and followed up by the nursing staff, since the risk of extravasation is increase and, if it occurs, there will be an opportunity to minimize the damage[17,18].

Contrast extravasation is not only a concern for healthcare teams; it also affects other teams, as it is associated with different risks, which, depending on the patient, can include fragile blood vessels, a need to do the puncture with metallic needles instead of plastic catheters or to provide chemotherapy treatment before the administration of the

CM, communication difficulties (with older adults, children or unconscious patients), among other situations.

It was demonstrated that, in addition to mitigating the risks of extravasation, steps that precede the examination are also involved in the work of the nursing team. One of these steps is verifying the preparation that must be done by the patient to improve the visualization of the organs, enabling an adequate evaluation of the image[19].

Other words cited demonstrate other activities carried out by the nursing team in the SRDIA before and during the examinations and the different attributions of nursing professionals in these services, which include activities such as checking the patient's previous preparation, positioning the patient at the examination table, administering the contrast, among others. These activities are important for carrying out the exams and, consequently, are associated with the quality of the images obtained and the accuracy of the pathology report.

> [...]*nursing professionals' work include positioning patients in the examination room, preparation, medications such as contrast, care for intercurrences, internal auditing, management of indicators, extravasation indicators, accidents with sharp objects, adverse events. They are also associated with the courses, the training of the sectors* (E3- RC/CT).

A study demonstrated the relevance of the nursing team in the MRI room and during the exam, as these professionals use various skills such as knowledge of imaging techniques, information, preparation, communication and patient safety to guarantee that the exam goes well and to help improving the image by orienting and supporting the patient's immobility during the exam[5,19].

> [...] *so I think that the nursing team has contributed a lot in the process, there is the procedure of the care team that assists the patient, and the nursing team will position them. Nursing professionals ask questions based on the nursing requirements in the anamnesis* (E13-CSC).

To improve the quality of the images and to obtain a safe report, before starting the exam, the nursing professional checks if the patient has prepared as requested when scheduling the exam. The statement below demonstrates the importance of communication with the patient and between the teams

> [...] *when it is an examination of the abdomen and the patient arrives for the examination and the nurse verify they have an empty bladder, the exam is delayed and, as the medical record shows who confirmed the examination, we can identify who is the person that is not asking the patient to drink water* (E10- NC).

To provide an adequate care, the professionals in accredited imaging service try to respond to the demands of patients, who have become increasingly demanding over the years. For this, the partnership between the nursing, medical, radiological and administrative staff is essential, as the quality of teamwork is associated with the quality and safety of the service provided in accredited services and an interruption in interaction and/or communication can result in safety failures with possible harm to the patient[3,6].

Nursing has been adapting to the context of technological advances, seeking a balance between care and technology and providing individualized care, distinguishing the patient from the equipment.

Thematic block 2 – nursing and patient safety in radiology

Patient safety in accredited imaging services is part of the "quality management" system, which is one of Padi's 5 principles, as it is essential to ensure transparency in activities related to patients and to their safety[7].

The nursing team is committed to this objective and their participation has been expressed in the results of external evaluations of the quality of services. This is in line with their purpose, which is to provide benefits to the patient in all stages of the imaging exam and to implement safety actions that include care regarding exposure to radiation, electromagnetic field, use of medication, administration of contrast, protection of patient data, among other actions that aim to guarantee the physical and emotional well-being of the patient[16].

> [...] *Quality management is implemented by nursing, and it is already very important for patient safety. As an example, I think nursing is essential for the implementation of the Padi, as they are in a direct relationship with the patient* (E14-RC).

Quality management objectives are closely associated with risk management, patient safety and the implementation of safety improvements in imaging services. The American College of Radiology recommends that, for the administration of ICM in patients undergoing imaging tests such as tomography, which is a concern pointed out in several speeches, there must be protocols for prescription, with clear

indication of the dosage required for the exam, protocols that minimize the possibilities of adverse reactions/events and damages, and medications and a team with a trained physician and nursing staff readily available for treating mild, moderate or severe reactions if they occur[16].

Historically, in the treatment of reactions, especially severe ones, the radiologist, who must always be present with the nursing staff, is not well prepared, which is probably related to the low occurrence of this type of reaction[14].

Based on this, Padi requests that imaging services have a described and disclosed protocol for emergency care and a team with at least one radiologist with a valid certificate of training in Radiology Life Support (RLS), Advanced Cardiovascular Life Support (ACLS) or Basic Life Support (BLS). However, even though the program requires trained staff, the RLS is not available to nurses, which can compromise patient safety in urgent and emergency situations in radiology and diagnostic imaging.

The benefit to the patient is likely to increase if care is provided effectively by properly trained and qualified professionals, which can affect the quality and safety of care. This issue is recognized in the following statement[7,16].

> *Nursing had no protocol, each professional did it the way they thought it should be, but now all the processes are established. Nursing improved with the implementation of quality management, we had to create certain documents, protocols for care in complications and emergencies, and we help each other, because nursing and doctors are practically one in imaging services. I think nursing professionals should participate in the RLS course, as they have the same difficulties as doctors who have no practice in emergency care.* (E20-MC).

The RLS course is offered by the CBR only to radiologists, and it is clear how doctors feel supported by the nursing team. These professionals follow protocols for intercurrences, which are adjusted with the entire team.

According to the speeches, nursing professionals, who are the closest to the patient, are responsible for educating their team about the action, side effects and possible damages associated with the administration of drugs. Along with the medical team, they must be prepared to initiate the safety protocol implemented in cases of emergencies, as well as the established processes to request an ambulance for the patient or hospitalization, if necessary[7,16].

Nurses play a fundamental role in their team, whether in accredited or non-accredited services, as they are responsible for decision-making, pointing out the strategies for the implementation of care actions, managing, teaching, and researching. Studies show that, especially in certified services, the management dimension prevails over the technical work of the rest of the team[3].

Some speeches revealed an understanding that the training of nursing professionals makes them able to act in various dimensions of care, regardless of their involvement in the accreditation process. Considering the high number of customers and the specificities of the different methods of examinations, radiology and diagnostic imaging services are settings that allow nursing professionals to manage care, aiming for a comprehensive, safe, quality, and humanized care.

> [...] *the nursing technicians, the entire nursing team has a lot of demands, my perception is that they are concerned with the work processes that they know and put into practice, but I do not correlate this with Padi, but with quality management and training* (E9-NC).

The work processes in nursing are divided in care-assist, administer-manage, research, and teach, and according to the qualification required by the degree of complexity of the actions. Their professional practice in the SRDIA, attributed to their training, requires more time of direct interaction with the patient, providing the opportunity for developing a critical view. However, quality management and its concepts and the applicability of actions that involve risk management, patient safety and quality monitoring are not subjects taught in their technical and academic training[7–12].

To fill this training gap, training and qualification activities must use institutionally recognized protocols and meet the level of complexity determined by the professional legislation in nursing and in radiology and diagnostic imaging. In addition, this training must also comply with the World Health Organization (WHO) patient safety guidelines, which include, for example, hand hygiene, an international goal[3,6].

Due to their training, nursing professionals are at the forefront of health education in accredited health services. Likewise, in the SRDIA nursing has been a leading team, whether in management or in the execution of work processes for improving service quality and patient safety, demonstrating attention to the environment, corroborating the speeches below[20].

> [...] *there is no way to imagine radiology without nursing; today it is a very broad area, and they end up being responsible for quality management and for part of the service itself* (E7-MaC).

As part of the management dimension, in accredited imaging services, some of the monitoring, analysis and results

data evidenced in the indicators recommended by Padi are attributed to nursing professionals. The measurement of performance and the evaluation of the achievement of the goals established rely on reliable records made by the nursing team. The program requires the development and analysis of indicators of, for example, internal audits, extravasation of contrast, accidents with sharp objects and adverse events, in addition to the records of their analysis to justify decision-making processes and actions developed to improve the quality and safety of the service[7,8].

From the perspective of service professionals, health education is present and has been used as a strategy to stimulate critical reflection and adoption of protocols for the safety of patients, professionals, employees and visitors[3,12].

> [...] *there are two points, nursing professionals are health workers with training in the health area, which in itself can guarantee at least patient safety and record control* (E9-QC).

The work processes in this setting represent a partnership between the medical, nursing, radiological and administrative staff. Therefore, an interruption in interaction and communication can result in serious failures in safety, with possible harm to the patient.

> [...] *the nursing records the administration of the contrast in the prescription signed by the doctor, which is the protocol before the exams, and the volume to be injected is calculated according to the patient's weight and the characteristic of the contrast* (E20-CM).

The purpose of providing safe and quality care unites the entire team and creates an environment for the dissemination of a safety culture. In this context, the prescription of the quantity of CM according to the indication of the exam and the calculation of the body mass of each patient aims to minimize the risks of AEs and possible and avoidable damages [2,6].

The main trend for the nursing of the future is for professionals to become more and more qualified. In this context, radiology can be considered a peculiar specialty in the area of nursing practice, requiring a greater depth in specific issues of physics and radiological protection, which involve the safety of the patient, of the environment and of the professionals. This confirms the need for updating on this topic, in order to improve the quality of care for patients undergoing radiological and diagnostic imaging procedures[2].

The limitations of this research are in the study settings, which were the first outpatient radiology and diagnostic imaging services with Padi's accreditation certificate. In addition, memory bias may have occurred, as the participants participated in the accreditation process of these services at least six months before certification.

FINAL CONSIDERATIONS

The work of nursing professionals includes quality management, developing actions to mitigate risks and damages, recording and managing adverse events and acting in educational processes, focusing on the quality of care and of images from the perspective of patient safety.

The perception of the leaders of the multiprofessional teams about the performance of nursing professionals generates a great contribution and shows recognition of their work, whether in teaching management, in the care actions or in the sharing of the knowledge produced.

Technology is increasingly part of nursing, and their work in radiology and diagnostic imaging requires specialized knowledge to recognize, prevent and care for possible complications related to imaging exams. These professionals are responsible for advising patients and families about radiological protection and risks of adverse reactions to drugs, elaborating care protocols, managing people and materials and supervising the team.

Therefore, it is important to address this specialty in undergraduate, extension and lato sensu graduate courses, since the complexity of the procedures and the technology of the equipment will increase, expanding the number of these accredited services, in which the specialized nursing professionals will often be required.

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Acknowledgment:
To the Research Support Foundation of the State of Rio de Janeiro – FAPERJ.

Authorship contribution:
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The authors declare that there is no conflict of interest.

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Associate editor:
Adriana Aparecida Paz

Received: 04.09.2021
Approved: 11.16.2021

Editor-in-chief:
Maria da Graça Oliveira Crossetti