

## RADIOLOGIST ASSISTANT: IMPROVING PATIENT CARE WHILE PROVIDING WORKFORCE SOLUTIONS IN SAUDI ARABIA

Yasser Hussain Hadi<sup>1</sup>, Abdulrahman Ibrahim Abu Aqil<sup>2</sup>, Qurain Turki Alshammari<sup>3\*</sup>

1. *Department of Medical Imaging and Intervention, King Abdullah Medical City (KAMC), Makkah Health Cluster, Makkah, Saudi Arabia.*
2. *Department of Radiology, University Medical Centre, Umm Alqura University, Makkah, Saudi Arabia.*
3. *Department of Diagnostic Radiology, College of Applied Medical Sciences, University of Hail, Hail, Saudi Arabia.*

### ARTICLE INFO

#### Received:

27 Mar 2023

#### Received in revised form:

03 Jun 2023

#### Accepted:

05 Jun 2023

#### Available online:

28 Jun 2023

**Keywords:** Radiologist assistant, Workforce, Radiology, Healthcare, Saudi Arabia

### ABSTRACT

The radiologist assistant (RA) is a relatively new role that holds considerable potential for improving access to healthcare services and addressing some of the workforce issues that plague healthcare. The major objective of this review is to examine the role of radiologist assistants in improving patient care in the Kingdom of Saudi Arabia (KSA). It also provides workforce solutions that will enable radiology technologists (RTs) to pursue a satisfying career path and offer the highest quality of care for patients. RAs are trained in patient assessment, pathology, anatomy, physiology, diagnostic imaging fundamentals, radiation safety, medical and legal standards, general patient care, lifesaving procedures, and interventional radiological procedures. The advantages of hiring RAs include reducing the shortage of radiology experts, especially in rural areas, improving the productivity of physicians and other specialists, and cost savings. The RA is an innovative way to meet patient needs and to improve the quality, efficiency, and productivity of radiological services in the Saudi Arabian healthcare system. Moreover, RAs can help balance higher patient volumes with quality patient care by improving radiology department workflows. The recommendation is that the use of RAs in KSA should be structured in such a way that their responsibilities do not overlap with those of radiologists. In addition, there must be a consensus on the qualification and even licensure requirements for RAs from the local authority institute, Saudi Commission for Health Specialties "SCFHS", to ensure a proper legal footing for RA graduates and it is accredited by the SCFHS.

*This is an open-access article distributed under the terms of the [Creative Commons Attribution-Non Commercial-Share Alike 4.0 License](https://creativecommons.org/licenses/by/4.0/), which allows others to remix, tweak, and build upon the work non commercially, as long as the author is credited and the new creations are licensed under the identical terms.*

**To Cite This Article:** Hadi YH, Abu Aqil AI, Alshammari QT. Radiologist Assistant: Improving Patient Care While Providing Workforce Solutions in Saudi Arabia. *Pharmacophore*. 2023;14(3):78-83. <https://doi.org/10.51847/QWhteBcfZI>

### Introduction

Radiology and radiologic technology emerged over a century ago, but they continue to grow and develop. Over the decades, safety, technology, and patient care have improved. In the healthcare landscape, ever-changing patient needs have prompted the establishment of unique roles such as the advanced practice nurse, dental assistant, and more recently, the radiologist assistant (RA) [1]. Workforce shortages in the radiology specialties and an increase in patient volume indicate a need for extensions of the role of the radiologist. The identification of necessary vocational and supportive extensions of the radiologist's role is essential to improve the performance of radiology departments and bridge the gap in the workforce.

The RA is a relatively new role in healthcare [2]. RAs are trained radiographers who work under the supervision of radiologists to carry out radiological procedures including fluoroscopy-guided gastrointestinal, genitourinary, musculoskeletal, and interventional radiology (IR) procedures. RAs use their advanced skills and qualifications to carry out procedures that do not require radiologist-level expertise [3] and work with patients before, during, and after radiological procedures. Advanced practice RTs have a technical background that is patient-centered, so they are an ideal mid-level provider in an imaging-centered clinical setting.

**Corresponding Author:** Qurain Turki Alshammari; Department of Diagnostic Radiology, College of Applied Medical Sciences, University of Hail, Hail, Saudi Arabia. E-mail: [g.algrain@uoh.edu.sa](mailto:g.algrain@uoh.edu.sa)

In order to advance in their profession, skilled technologists typically move into management, teaching, sales, or consulting [2, 3]. As a result, many of the best technologists are taken out of the patient care setting. Technologists with experience and expertise would remain in the clinical environment if the career ladder for RTs were expanded [4]. Through the RA program, RTs with clinically adept skills will have an opportunity to advance into higher positions and grow professionally [1, 3]. The initiative will increase productivity and efficiency at a time when demand for medical imaging services is soaring and there are widespread shortages [5]. Providing high-quality healthcare and minimizing wait times are expected in healthcare settings. RAs can assist medical centers in balancing these expectations with increasing patient volumes by improving productivity and efficiency [3]. The input of RAs is vital in taking pressure off radiologists and other specialists that use images from radiological procedures. The current review was conducted to examine the potential role of RAs in improving patient care in the Kingdom of Saudi Arabia (KSA) and providing workforce solutions so that RTs can pursue a career path that is professionally satisfying for them, as well as allowing patients to receive the highest quality of care possible.

An initial search of the databases EMBASE, Scopus, and PubMed was performed. The key terms were radiologist assistant, workforce, radiology department, and healthcare, which were used in various combinations. A subsequent search of world-class radiology journals, such as *Radiology* and *Radiographics*, was also performed. Articles not in English were excluded. The articles were used to collect information on the clinical role of RAs to enhance patient care in KSA by extending the capacity of the radiologist in the diagnostic imaging environment.

## Results and Discussion

### *Training, Responsibilities, and Education*

An advanced-level RA enhances patient care by assisting the radiologist in diagnostic imaging activities [1, 6]. RAs are trained in various skills and concepts to ready them for their clinical responsibilities. RAs receive patient assessment training to enable them to assess patients with varied conditions and diseases to determine the right diagnostic procedure and the value of radiological procedures [1]. RAs also receive pharmacology training aimed at ensuring they understand the effects of medication on the anatomy, physiology, and pathology of the human body. Anatomy and physiology training is also vital for RAs to ensure that they know the structures and functions of the human body. Diagnostic imaging fundamentals, radiation safety, medical and legal standards, general patient care, lifesaving procedures, and radiological procedures are all important content areas in an RA course or program [6].

The RA is a radiology technologist (RT) who has completed an advanced academic program encompassing a nationally recognized RA curriculum and a radiologist-directed clinical preceptorship. The length of the RA program differs with the type. However, those that wish to apply for a registered RA credential should enroll in a bachelor's degree program in radiological sciences and then apply for a postgraduate RA program. It is recommended that candidates have completed approximately 2000 clinical hours as RTs. The intensive clinical training RAs receive allows them to work without extensive on-the-job training. An analysis by Ten Napel *et al.* highlighted RAs' technical and imaging background as a determinant of their ability to work immediately without further training [7]. The admission requirements are typically good grades in math, biology, and chemistry at the high school level. Upon completing the RA training program, licensure may be necessary before practicing. In the United States, as an example, more than 30 states require RAs to be licensed. Moreover, the licensing requirements for RAs may vary across states and are determined by the state health board [6, 8]. Typically, RAs should pass an exam before they are certified as registered RAs; however, this is not a requirement in all jurisdictions.

RAs require a wide variety of soft and hard skills. First, RAs should have a thorough grasp of the science of injury and disease. This information is vital in ensuring that RAs make medical diagnoses and deal with patients who have different medical conditions. Secondly, RAs should understand medical technology and keep up with advances in such technology, especially those related to radiology. Other valuable skills that RAs should possess include good verbal communication skills, computer skills, fine motor skills, advanced problem-solving skills, good decision-making skills, teaching skills, and physical coordination.

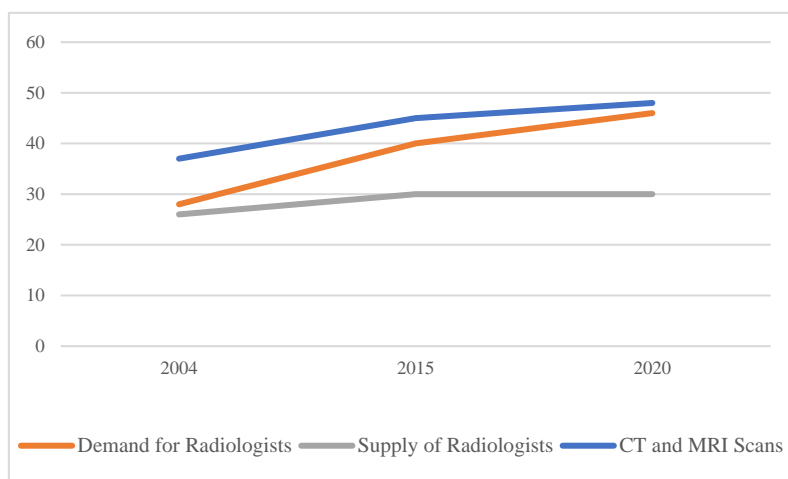
It is also the RA's responsibility to make initial observations of diagnostic images, but they do not provide an official interpretation (final written report). A radiologist supervises the RA's duties, and the RA does not provide an official interpretation of imaging examinations. The role of an RA is to assist radiologists in providing diagnostic imaging services to patients under the supervision of radiologists. An RA is responsible for performing patient assessments, guiding patients through prescribed imaging procedures, and completing selected procedures. In addition, RAs can perform fluoroscopic studies, inject contrast media, place needles and catheters, and post-process images. They can also improve patient satisfaction by performing patient-centric, outcomes-based, quality-improvement procedures.

### *Advantages of Hiring an RA*

Approximately 25% of KSA's 40 million population is expected to be 60 or older by 2050. Over the same time, the number of people who are 80 or older is expected to reach 1.6 million [9]. In the coming decades, the demand for healthcare services, including radiology, will rise dramatically as the population ages. As far as patient care is concerned, physicians are not the only players to consider. An appropriate scope of practice could benefit from the addition of RAs. An RA could be a cost-effective and innovative way to address the shortage of radiologists and RTs. In addition to taking the lead in patient assessment and management, the RA could perform procedures such as fluoroscopy, ultrasound, and IR procedures. This would allow

radiologists to focus on medical interpretation requirements. The RA will improve patient access to radiological care by improving radiology workflow.

Hiring RAs can ease the shortage of radiologist experts in rural areas. Many healthcare experts prefer to practice in urban areas where they have access to a range of amenities and educational opportunities. As a result, rural areas often suffer from a shortage of radiology experts [10]. The concept and role of the RA arose from the realization that a shortage of radiologists was looming. Increases in the number of surgical procedures and a higher number of retiring radiologists relative to those entering the workforce were highlighted as major drivers for the expected shortage [11, 12]. Moreover, while the supply of radiologists has stagnated, demand for them continues to grow (**Figure 1**). RAs are easier to train, from cost and time perspectives, and can complete most radiology tasks without the input of radiologists [13]. Thus, hiring RAs can help ease the shortage of radiological experts.



**Figure 1.** Growing gap between the supply of and demand for radiologists

Hiring RAs increases the productivity of physicians, radiologists, and other specialists. In cases where RAs work alongside radiologists, their participation in tasks for which they are qualified frees up radiologists to engage in other, more specialized and demanding, tasks. The presence of RAs allows radiologists to divest themselves of some of the non-interpretative radiology duties [14]. In order to reduce the workload of radiologists and improve workflow to obtain an optimal quality of services, an RA can assist with evaluating patients' medical histories to ensure the various medical imaging protocols, perform image-guided diagnostic procedures, and suggest alternative medical imaging techniques, when necessary. In busy radiology departments, where the new norm remains to increase volumes of complex studies and procedures, employing RAs as support staff could help increase throughput. The potential positive impact RAs can have on workflow consists of reducing the number of telephone calls and minor procedures that might disturb radiologists' interpretation work. Radiologists are initially hesitant, but once they see RAs working, they want more of them [14]. The level of education and commitment of RAs is greatly appreciated by radiologists [12, 14].

The increased efficiency reduces delays in the completion of radiology tasks. RAs working alongside radiologists and other specialists can free them up from engaging in tasks such as assessing the diagnostic value of radiological imaging, imaging the patients, and interpreting the output of these images. As a result, radiologists will have fewer responsibilities, which can contribute to improving their productivity. With the proper apportioning of duties and responsibilities, RAs may be able to relieve radiologists of excess clinical duties and help create a more conducive work environment for them [15, 16]. Improved efficiency can also contribute to improving levels of patient satisfaction [3].

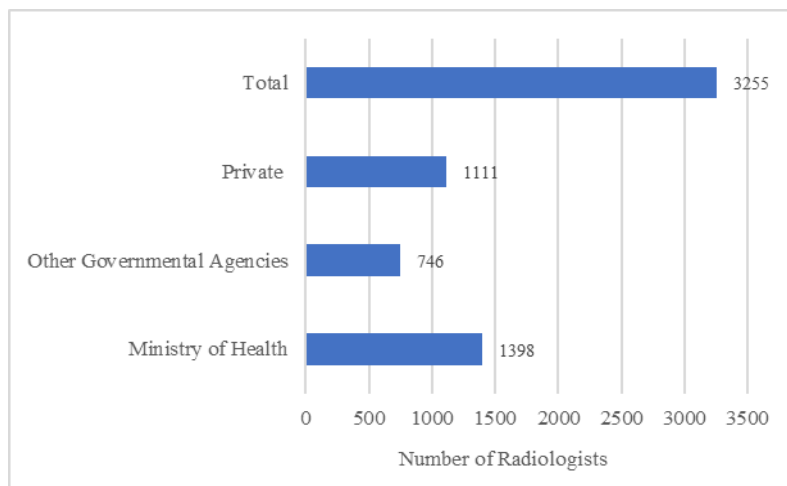
In some cases, RAs can lead to cost savings. RAs receive considerably lower salaries than radiologists. The cost of training RAs is also lower than that of training radiologists. The incorporation of RAs into radiological procedures offers a way to increase reimbursement possibilities and reduce procedure-related costs [17].

Interest in the RA program is shaped by the perceived competitiveness of the course in the job market [18]. Hence, hiring RAs has the impact of improving such competitiveness, which increases the likelihood of more learning institutions offering RA programs [16], thus increasing the number of available RAs in the job market in the long term.

Lastly, establishing a career path for RTs could serve as a potential recruitment and retention tool. A report by Rebecca Clemens, a radiographer at East Surrey Hospital, Redhill, England, outlines the benefits of RAs, including improved job satisfaction, increased recruitment, greater self-esteem, a greater sense of body confidence, and increased morale [12]. By integrating the RA into the career path of RTs, the field will become more appealing to potential recruits, and upward mobility among current technologists will be facilitated [12]. RTs have the opportunity for unique professional development through qualifying as RAs.

*The Need for RAs in KSA*

KSA is a nation of over 35 million individuals. According to a Statista report in 2020, there were expected to be 3255 radiologists in the nation by 2022 [19]. Most radiologists are employed by the Ministry of Health (MoH), while the remainder are either employed by the private sector or other governmental agencies (**Figure 2**). Thus, the nation has approximately one radiologist for every 1000 residents. The shortfall in the number of radiologists is in line with the general shortfall of healthcare providers in the nation [20]. The problem is exacerbated by the fact that most radiologists work in urban areas. Most government hospitals in the nation are in urban or peri-urban areas, while private clinics and facilities play an important role in the provision of healthcare services in remote areas. From the data, it is apparent that KSA has a shortage of radiologists.



**Figure 2.** Number of radiologists by sector in KSA [19]

KSA is experiencing a notable increase in the demand for diagnostic imaging services and facilities. Cancer, which is a major cause of the rising burden of healthcare in KSA, is also a major factor in the rising demand for radiological services. In the year 2020, more than 25000 new cancer cases were reported in KSA [21], and the country had a considerably higher number of new cancer cases than Kuwait or the United Arab Emirates (UAE). The rising incidence and prevalence of cancer in KSA contribute to the increasing demand for imaging services.

The Saudi population is aging. The proportion of the elderly in KSA has been increasing steadily, and estimates reveal that it will continue increasing until the year 2050 [21]. Elderly people are at higher risk of chronic illnesses that typically require diagnostic imaging to monitor their progress. Thus, demographic changes are also likely to increase the demand for radiological services and the value of hiring RAs in KSA. The COVID-19 pandemic has also played a major role in increasing the demand for healthcare services, including the demand for radiological services [22].

A key role for RAs in KSA will be developing healthcare professions models that improve healthcare quality and solve workforce shortages. Curriculum revisions will be needed to prepare for this change. A well-educated RA will be needed to support viable radiological care models in KSA. In order to achieve job satisfaction and ensure longevity, it may be necessary to provide enhanced career opportunities and varied employment environments. Considering that patient safety is of paramount importance within the medical imaging field, the emerging RA must have formal training and be permitted to provide delegated patient care, according to KSA MoH regulations.

*Examples of RA Roles in Other Nations*

Several nations have RAs. In Belgium, RAs hold either master's or bachelor's degrees, with a majority holding the latter. The demand and compensation for RAs in Belgium are increasing. The trend is repeated in the United States, where 75% of RAs hold a bachelor's degree and the remainder hold a master's degree [23]. The practice requirements for RAs in the United States vary across states. However, at a minimum, RAs are required to complete a degree course from a recognized institution. RAs in the United Kingdom work closely with diagnostics and therapeutic radiographers, and their responsibilities include processing images, ordering stocks of consumables, helping in imaging procedures, ensuring the working environment is clean and hygienic, checking equipment and reporting faults, and inputting data [24]. However, there is no set requirement for RAs and imaging support workers, although employers, such as the National Health Service (NHS), may require healthcare qualifications [24-28].

There are several differences and similarities in the RA role across different nations. The similarities are mainly related to the responsibilities of the RA. In most cases, RAs are tasked with helping radiologists with non-interpretive duties. However, in other cases, they also handle non-clinical responsibilities, such as ordering stock and consumables. The main differences are in the training and licensure requirements. While some states in the United States and some European nations have formal educational requirements for RAs, others do not. The RA role was introduced in these countries to minimize time pressures faced by radiologists due to ongoing workforce shortages, to provide RTs with a satisfying career path, and to ensure patients receive the best care possible.

### *Concerns About the Scope of Practice of RAs*

Concerns remain about the scope of practice of RAs, and there has been some misinformation about their role in radiology practice for quality-of-care reasons [29]. Another potential source of misunderstanding is that RAs are delegated authority (from physicians) to perform services that physicians determine RAs are qualified to perform [14]. The RA position exists to relieve radiologists of day-to-day tasks, allowing radiologists to focus on image review and assessment. RAs are radiologist extenders, not replacements. Therefore, there should be regular meetings with the supervising team to review and evaluate the skills of the RA to ensure the quality of the health service.

Furthermore, it is concerning that academic programs are employing RAs in a role that, at least on paper, is so similar to that of a radiology resident. As their numbers increase, RAs will undoubtedly have an impact on resident education. The impact could extend to the number of hours of direct training with consultants as the radiologists would supervise both the residents and RAs. Each program should maintain the quality of learning outcomes for both residents and RAs. The directors of each program must ensure that the educational process runs smoothly and without interference.

Another issue to be considered by the Saudi Commission for Health Specialties (SCFHS) is RAs' input. This will be critical in ensuring that the RAs' certification examination appropriately reflects the scope of practice embodied in the roles and responsibilities of RAs and the credentials necessary to take the examination. The MoH Commission on Human Resources will continue to monitor workforce shortages for radiologists and RAs over time to determine what effect RAs have on the recruitment of radiological technologists into the field.

### **Conclusion**

The review aimed to explore the role of RAs in improving patient care, providing workforce solutions in KSA, enabling RTs to pursue a satisfying career path, and offering the highest quality of care for patients. According to the evidence reviewed, the KSA health system would benefit from RAs. Several factors contribute to the rise in demand for radiological services, including demographics, health, and the workforce. A framework for enhancing the use of RAs is needed for the KSA health system to meet its growing radiological needs at a low cost. Doing so will free up radiologists for other, more specialized, tasks, and radiology departments will be able to increase productivity and efficiency in order to balance the expectation of increasing patient volumes and improving the department workflows. However, the use of RAs in KSA should be structured in such a way that their responsibilities do not overlap with those of radiologists. Moreover, there must be a consensus on the qualification and even licensure requirements for RAs from the SCFHS to ensure a proper legal footing for RA graduates. To achieve this, the Radiologist Assistant Program must be provided and accredited by the SCFHS.

**Acknowledgments:** The authors would like to acknowledge all Medical Agencies who providing the statistic in the articles.

**Conflict of interest:** None

**Financial support:** None

**Ethics statement:** None

### **References**

1. Williams CD, Short B. ACR and ASRT development of the radiologist assistant: concept, roles, and responsibilities. *J Am Coll Radiol.* 2004;1(6):392-7. doi:10.1016/j.jacr.2003.12.026
2. Shannon LM, Awan OA. Are radiologist assistants the quintessential solution for modern radiology departments? *Radiographics.* 2020;40(5):1502-3. doi:10.1148/rg.2020190199
3. Shay W, Silva D, Mohabir H, Erinjeri J. The effect of radiologist assistants in an interventional radiology department. *Radiol Technol.* 2017;88(3):333-8.
4. Davidescu L, Jurca R, Ulmeanu R. Value of adding behavioral-cognitive therapy to standard treatment in smoking cessation programe: results of Smoking Cessation Center Oradea on 7 years. *Eur Respir J.* 2014;44(58):41-61.
5. Dumitru M, Berghi ON, Taciuc IA, Vrinceanu D, Manole F, Costache A. Could Artificial Intelligence Prevent Intraoperative Anaphylaxis? Reference Review and Proof of Concept. *Medicina.* 2022;58(11):1530.
6. May LM, Martino S, McElveny C. The establishment of an advanced clinical role for radiographers in the United States. *Radiography.* 2008;14(4):24-7. doi:10.1016/j.radi.2008.04.007
7. Ten Napel TL, Sanders VL, Wright DL. Radiologist assistant: best fit for medical imaging. *Radiol Manage.* 2014;36(2):22-7.
8. Ellenbogen PH, Hoffman TR, Short BW, Gonzalez A. The radiologist assistant: what radiologists need to know now. *J Am Coll Radiol.* 2007;4(7):461-70. doi:10.1016/j.jacr.2007.03.006
9. Abusaaq HI. Population aging in Saudi Arabia. Economic Research Department, Saudi Arabia. Erratum in: *Saudi Arabian Monetary Agency.* 2015.

10. Wright DL, Killion JB, Johnston J, Sanders V, Wallace T, Jackson R, et al. RAs increase productivity. *Radiol Technol.* 2008;79(4):365-70.
11. Bennett SE. Advantages of hiring a radiologist assistant. *Radiol Technol.* 2006;78(1):9-10.
12. Advanced Practice Advisory Panel. The radiologist assistant: improving patient care while providing work force solutions. ASRT. March 9-10, Consensus Statements. 2002.
13. Cowling C. A global overview of the changing roles of radiographers. *Radiography.* 2008;14(4):28-32. doi:10.1016/j.radi.2008.06.001
14. Baker SR, Merkulov A. The radiology assistant: a contrarian's view. *Emerg Radiol.* 2005;11(4):187-92. doi:10.1007/s10140-005-0400-9
15. Hawkins CM, Bowen MA, Gilliland CA, Walls DG, Duszak R Jr. The impact of nonphysician providers on diagnostic and interventional radiology practices: operational and educational implications. *J Am Coll Radiol.* 2015;12(9):898-904. doi:10.1016/j.jacr.2015.03.034
16. May LM. The radiologist assistant: a new member of the radiology team. *J Radiol Nurs.* 2005;24:31-2.
17. Ludwig R, Ferrara TL. What is your radiologist assistant student worth to you? *J Am Coll Radiol.* 2008;5(2):115-8. doi:10.1016/j.jacr.2007.10.018
18. Ludwig R. Assessing interest for a radiologist assistant program. *Radiol Technol.* 2004;76(1):73-4.
19. Saleh S. Number of radiologists in Saudi Arabia by sector. Statista. 2023. Available from: <https://www.statista.com/statistics/608546/number-of-radiologists-in-saudi-arabia-by-sector/>
20. Alnowibet K, Abduljabbar A, Ahmad S, Alqasem L, Alrajeh N, Guiso L, et al. Healthcare human resources: trends and demand in Saudi Arabia. *Healthcare (Basel).* 2021;9(8):955. doi:10.3390/healthcare9080955
21. Mordor Intelligence. Saudi Arabia diagnostic imaging market - growth, trends, COVID-19 impact, and forecasts (2022 - 2028). 2023.
22. Weisberg EM, Chu LC, Rowe SP, Fishman EK. Radiology, COVID-19, and the next pandemic. *Diagn Interv Imaging.* 2021;102(10):583-5. doi:10.1016/j.diii.2021.07.004
23. Salary Expert. Radiology assistant salaries by country. ERI Economic Research Institute, USA. 2023. Available from: <https://www.salaryexpert.com/salary/browse/countries/radiology-assistant>
24. National Health Service (NHS). Radiography assistants and imaging support workers. 2023. Available from: <https://www.healthcareers.nhs.uk/explore-roles/healthcare-support-worker/roles-healthcare-support-worker/radiography-assistants-and-imaging-support-workers>
25. Alshammari QT, Alshammari E, Almutairi W, Alrashidi O, Alshammari MT, Kumar Sh, et al. The Efficiency of MRI in Determining the Lower Back Pain associated with lumbar disc pathology. *Biosci Res.* 2023;20(1):77-82.
26. Yousif E, Loaz O, Almohiy H, Algahtani M, Alelyani M, Salih M, et al. Clinical Evaluation and Standardization of Image Quality and Technical Protocols for Special Radiological Procedures. *Int J Pharm Res Allied Sci.* 2023;12(1):116-22. doi:10.51847/mLIG3c7oEi
27. Alshammari QT, Salih M, Gameraddin M, Yousef M, Abdelmalik B, Loaz O. Accuracy of magnetic resonance spectroscopy in discrimination of neoplastic and non-neoplastic brain lesions. *Curr Med Imaging.* 2021;17(7):904. doi:10.2174/1573405617666210224112808
28. Alshammari QT, Almutairi W, Alshammari E, Alrashidi O, Alshammari MT, Alyahyawi AR, et al. Cardiac Magnetic Resonance Imaging Feature Tracking for Quantifying Left Ventricle Deformation in Type 2 Diabetic Patients. *Int J Pharm Res Allied Sci.* 2022;11(4):115-22. doi:10.51847/DGpw4YL4Ox
29. Mekeres GM, Buhaş CL, Csep AN, Beiuşanu C, Andreescu G, Marian P, et al. The Importance of Psychometric and Physical Scales for the Evaluation of the Consequences of Scars—A Literature Review. *Clin Pract.* 2023;13(2):372-83.