

Midocean University

College of Management

Department of Risk Management



**The Impact of Artificial Intelligence on Healthcare: the
transformation of the practice of radiology in the kingdom of Saudi
Arabia in Riyadh**

Prepared by:

Haya Ibraheem Mohammed Aldosary

232000583

Supervisor:

Dr .Faisal Alfaisal

Dr. Walid Soliman

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شكرو عرفان

الى من أمسكت بيدي دوماً

وأمنت بي في سبيل العلم والتعلم

الى من بها أستقيم

والدتي

الأخصائية الاجتماعية / شيخة بنت سالم الدوسري

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Chapter one

1.1 Introduction

In recent years, the integration of artificial intelligence (AI) into various sectors has ushered in a new era of technological advancement, and nowhere is this transformation more evident than in healthcare. One particularly groundbreaking area is the practice of radiology, where AI has emerged as a catalyst for significant change. The Impact of Artificial Intelligence on Healthcare, with a specific focus on the transformation of radiology, signifies a paradigm shift in the way medical imaging is utilized, interpreted, and leveraged for patient care.

Radiology, as a critical component of diagnostic medicine, has traditionally relied on the expertise of radiologists to interpret complex images and identify anomalies. However, the advent of AI technologies has introduced a range of capabilities that augment and, in some cases, surpass human capabilities. This evolution not only enhances the accuracy and speed of diagnostics but also redefines the roles of healthcare professionals in the radiology domain.

This exploration delves into the multifaceted impact of artificial intelligence on the practice of radiology, elucidating how advanced algorithms, machine learning, and automation are reshaping workflows, improving diagnostic accuracy, and ultimately revolutionizing patient care. As we navigate the intricate intersection of technology and healthcare, it becomes increasingly evident that the synergy between artificial intelligence and radiology is poised to redefine the landscape of medical imaging, offering unprecedented opportunities for innovation and enhanced clinical outcomes.

While the integration of artificial intelligence (AI) into healthcare, particularly in the field of radiology, holds immense promise, it is crucial to acknowledge and address the accompanying risks. The transformative impact of AI in radiology is not without challenges, and a comprehensive understanding of the potential risks is essential for responsible implementation.

One primary concern revolves around the potential for overreliance on AI algorithms, leading to complacency among healthcare professionals. The technology, while powerful, is not infallible, and there is a risk that clinicians might become overly dependent on automated systems, diminishing their

own diagnostic skills and critical thinking. Striking the right balance between AI assistance and human expertise is imperative to ensure optimal patient care.

Privacy and data security represent another significant risk in the era of AI-driven healthcare. As vast amounts of sensitive medical data are processed and stored by AI systems, the potential for data breaches and unauthorized access becomes a pressing concern. Establishing robust cybersecurity measures and stringent privacy protocols is paramount to safeguarding patient information and maintaining trust in the healthcare system.

Moreover, the introduction of AI in radiology raises ethical considerations surrounding transparency and accountability. The "black-box" nature of some AI algorithms makes it challenging to understand their decision-making processes fully. This lack of transparency could raise ethical concerns, particularly when these systems are used in critical diagnostic decisions. Ensuring transparency, explainability, and accountability in AI algorithms is crucial for fostering trust among healthcare professionals and patients.

1.2 Study problem:

The research problem is that there is an impact of Artificial Intelligence (AI) on the healthcare industry.

1.2.1 The pivotal question

1.2.1.1 To what extent does the impact of the use of artificial intelligence contribute to increasing healthcare risks in radiology practice?

1.2.2 Sub- questions:

1.2.2.1 Identify the extent of the impact of artificial intelligence on healthcare.

1.2.2.2 Identify the most important risks of using artificial intelligence in health care and their impact on the transformation of the practice of radiology.

1.3 Important of the study:

1.3.1 The importance of the research focuses on the impact of Artificial Intelligence (AI) on the healthcare industry. AI has the potential to provide innovative solutions to the long-term challenges

faced by the sector, which makes it a significant development. The research examines how AI can revolutionize healthcare in the areas of diagnosis, patient care, and healthcare management. The research also considers the risks and benefits associated with the application of AI and its impact on radiology practices.

1.4 objectives of the research:

1.4.1 The objectives of the research are as follows:

1.4.1.1 Identify the extent of the impact of artificial intelligence on healthcare.

1.4.1.2 Identify the most important of using artificial intelligence in radiology.

1.5 Hypotheses:

1.5.1 The application of artificial intelligence (AI) in the healthcare industry has its advantages and disadvantages.

1.6 Theoretical model

In this study, we aim to determine the impact of Artificial Intelligence (AI) on the healthcare industry, specifically its potential to transform radiology practice. We will also investigate how the use of AI can increase the risk in healthcare, and to what extent it affects the industry. Additionally, we will identify the most significant risks of using AI in healthcare and evaluate their impact on the transformation of radiology practice.

Chapter Two

Literature review

2.1 Introduction

AI methods are expected to decrease the burden on physicians, improve the quality of patient care, and decrease overall treatment costs. Current conditions affected by COVID-19 pose new challenges for healthcare management and learning how to apply AI will be important for a broad spectrum of students and mature professionals working in medical informatics. This chapter focuses on the dependent and independent variables, and the nature of each variable in this study was as follows:

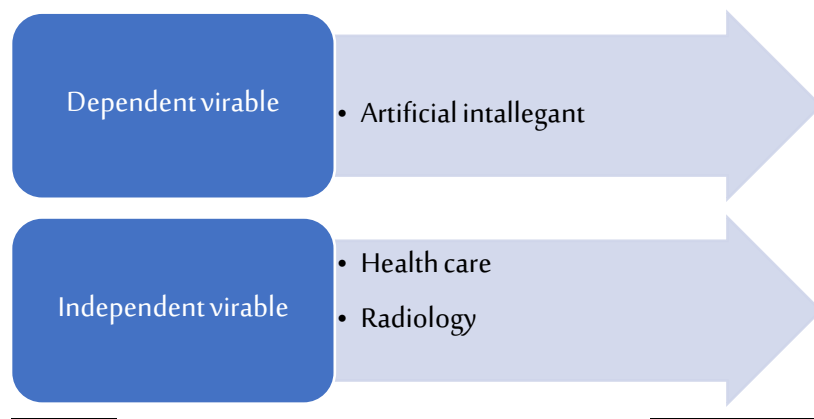


Chart number1: show the variables

2.2 Artificial intelligence (Dependent variable)

Artificial intelligence (AI) is a term used to describe computer systems that can perform complex tasks that were traditionally done only by humans. This includes things like reasoning, decision-making, and problem-solving. Nowadays, AI describes a wide range of technologies that power many of the services and goods we use daily, such as apps that suggest TV shows and chatbots that provide real-time customer support. However, not all these technologies truly embody artificial intelligence as we typically think of it. In this article, you'll learn more about what artificial intelligence is and the different types of AI that exist. You'll also explore the benefits and potential dangers of AI and discover flexible courses that can help you expand your knowledge of this fascinating field.

Artificial general intelligence (AGI) is the hypothetical state where computer systems can achieve or surpass human intelligence. It is the true artificial intelligence that is depicted in science fiction. However, researchers have not agreed on the exact meaning of "AI" and how to recognize AGI when it appears. The Turing Test or Imitation Game is the most famous approach to identifying if a machine is intelligent or not. It is an experiment where a human interrogator communicates via text with another human and a machine and judges who composes each response. If the interrogator can't reliably identify the human, then Turing says the machine can be said to be intelligent.

Researchers and philosophers have not agreed on whether we are beginning to achieve AGI, if it is still far off, or just impossible. Although, some researchers argue that Chat GPT-4 is an early form of AGI, many others are skeptical of these claims and argue that they were made for publicity. Regardless of how far we are from achieving AGI, we can assume that when someone uses the term artificial general intelligence, they refer to the sentient computer programs and machines found in popular science fiction.

2.3 Health care Radiology(Independent variable)

Radiology has been a unique medical specialty since its inception, due to its technical nature and challenges. The specialty arose from the difficulty of capturing, transporting, and developing X-ray images on fragile glass plates for interpretation. Although there was pressure in the early 1900s to define radiology as a technical service, it was determined that medically trained specialists were required for radiographic image interpretation and reporting. As a result, radiologists have been clinical specialists who are also experts in image capture technology, engineering, and information technology for healthcare, which continue to drive and be driven by radiology.

Nowadays, radiology is the primary diagnostic tool for many diseases and plays a crucial role in treatment monitoring and outcome prediction. Radiology has several imaging modalities, each with differing physical principles of varying complexity. These techniques have high levels of anatomical detail and sensitivity, and imaging is increasingly being used for ultrastructural diagnostics, nanotechnology, functional and quantitative diagnostics, and molecular medicine. Technological

advances in digital imaging have enabled images to be post-processed, manipulated, and transmitted rapidly worldwide for simultaneous viewing with the transmitting center.

Radiologists have been instrumental in these technological advances and have evaluated the strengths and weaknesses of different investigations. Radiologists have developed knowledge of the appropriate integrated imaging algorithms to maximize clinical effectiveness. They have also been responsible for implementing these developments into the clinical setting and ensuring the best use of assets and healthcare resources.

2.4 Summary of previous studies

Study 1	Artificial intelligence in radiology 2018 Nov 30
The objectives of the study	how these methods could impact multiple facets of radiology and demonstrate ways in which these methods are advancing the field. Finally, we discuss the challenges facing clinical implementation and provide our perspective on how the domain could be advanced.
Dependent variable	Artificial intelligence
independent variable	Radiology
Result and Recommendations	Humans will potentially benefit from the human-AI interaction, bringing them to higher levels of intelligence

Table 1: Show the study Artificial intelligent in Radiology 2018

Study 2	The Potential Dangers of Artificial Intelligence for Radiology and Radiologists 2020
The objectives of the study	Identify the potential dangers of AI
Dependent variable	Potential Dangers of Artificial Intelligence
independent variable	Radiology and Radiologists
Result and Recommendations	there are several ways to mitigate potential AI-based hacks and attacks. These include clear security guidelines and protocols that are uniform across the globe. The acceleration of data sharing during the current pandemic exposes critical vulnerabilities in data security. It reminds us of the pervasive threat that bad actors can and will exploit any technology for their selfish gains. Doing nothing is not a viable strategy, but acting in a concerted effort will lead us to the protection we need and is important as we push AI development over the next several years. consider some scenarios in which people may intend to cause potential errors within data sets of analyzed information, resulting in incorrect conclusions and leading to potential problems with patient care and outcomes.

Table2: Show the study The Potential Dangers of Artificial Intelligence for Radiology and Radiologists 2020

Study 3	Artificial intelligence in healthcare: transforming the practice of medicine 2021 Jul
The objectives of the study	outline recent breakthroughs in the application of AI in healthcare, describe a roadmap to building effective, reliable and safe AI systems, and discuss the possible future direction of AI augmented healthcare systems.
Dependent variable	Artificial intelligence
independent variable	healthcare: transforming the practice of medicine
Result and Recommendations	Studies have demonstrated AI's ability to meet or exceed the performance of human experts in image-based diagnoses from several medical specialties radiology Recommendations: • processes for ethical and responsible access to data: healthcare data is highly sensitive, inconsistent, siloed and not optimised for the purposes of machine learning development, evaluation, implementation and adoption • access to domain expertise / prior knowledge to make sense and create some of the rules which need to be applied to the datasets (to generate the necessary insight) • access to sufficient computing power to generate decisions in real time, which is being transformed exponentially with the advent of cloud computing • research into implementation: critically, we must consider, explore and research issues which arise when you take the algorithm and put it in the real world, building 'trusted' AI algorithms embedded into appropriate workflows.

Table3: Show the study The Artificial intelligence in healthcare: transforming the practice of medicine 2021 Jul

Study 4	Artificial Intelligence Transforms the Future of Healthcare
The objectives of the study	This article is a review of machine learning applications in healthcare with a focus on clinical, translational, and public health applications with an overview of the important role of privacy, data-sharing, and genetic information
Dependent variable	Artificial Intelligence
independent variable	Future of Healthcare
Result and Recommendations	Due to rapid technological advancements, tasks previously limited to humans will be taken on by algorithms. ⁷³ Machine learning's ability to transform data into insight will affect the field of medicine, displacing much of the work of radiologists and anatomical pathologists

Table4: Show the study The Artificial intelligence in healthcare: transforming the practice of medicine 2021 Jul.

Chapter three

Research Methodology

3.1 Introduction

In this study, a descriptive-analytical approach was employed to identify the impact of artificial intelligence on healthcare and radiology. The goal was to investigate the effect of AI on these fields. During the theoretical stage, the descriptive approach was used to clarify the variables of the study and focus on describing the effects and consequences of the use of artificial intelligence in healthcare in radiology. In the field phase, a questionnaire was developed for employees working in radiology to determine the potential impact of AI on their expectations.

3.2 Research design

Quantitative analytical study (retrospective)

3.3 Population of the study

3.4 sample characteristic

A sample of around 50 radiology staff has been taken from King Sayd Medical City using a simple random sampling method.

3.5 Sample size determination

I selected the general X-ray department at King Saud Medical City and the sample size was 50-person. Working there.

3.6 Data Collection Procedures

Data was collected by datasheet and poll.

3.7 method of analysis

The data was analyzed using a computer program called Excel and then presented in tables and charts.

Chapter Four

Practical Study

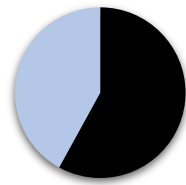
4.1 Analysis :

Q1- Gender

<u>Gender</u>	<u>Result</u>
<u>Male</u>	<u>29</u>
<u>Female</u>	<u>21</u>

Table: number 4

RESULT



■ MALE ■ FEMALE

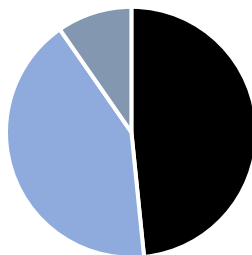
Chart number 1: show the result for gender

Q2-Qualification

<u>Qualification</u>	<u>Result</u>
<u>Diploma</u>	<u>15</u>
<u>Universal</u>	<u>33</u>
<u>Master and above</u>	<u>3</u>

Table: number 5

RESULT



■ DIPLOMA ■ UNIVERSAL ■ MASTER-ABOVE

Chart number 2: show the result for qualification

Q3 – The years of experience

<u>Experience</u>	<u>Result</u>
<u>0-3 years</u>	<u>10</u>
<u>4-10 years</u>	<u>25</u>
<u>11-more</u>	<u>15</u>

Table: number 6

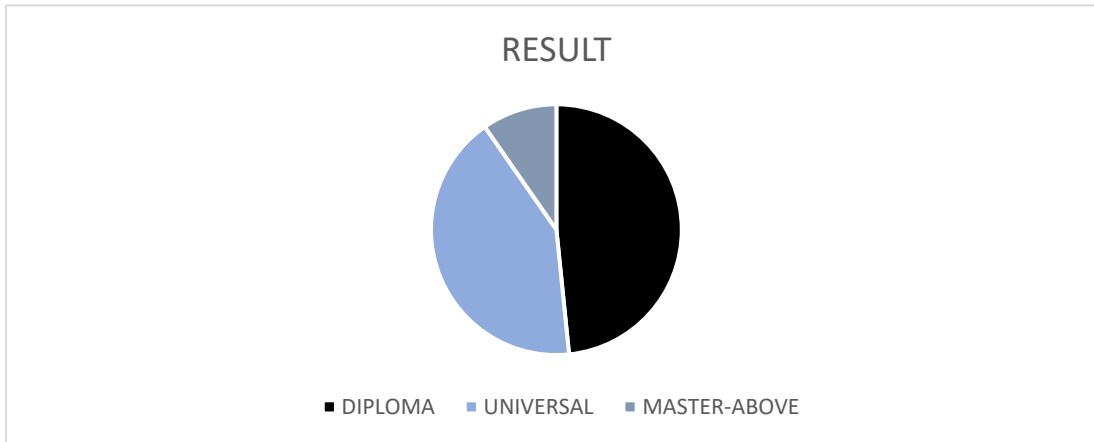


Chart number 3: show the result for qualification

Q4 - Do you have knowledge about the uses of artificial intelligence in radiology?

<u>YES</u>	<u>31</u>
<u>NO</u>	<u>19</u>

Table: number 7: show the result of Q4

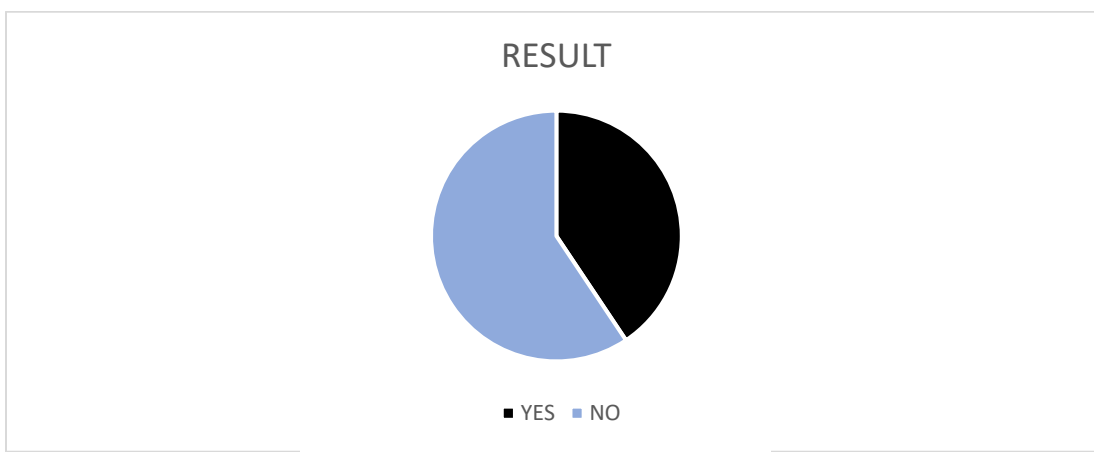
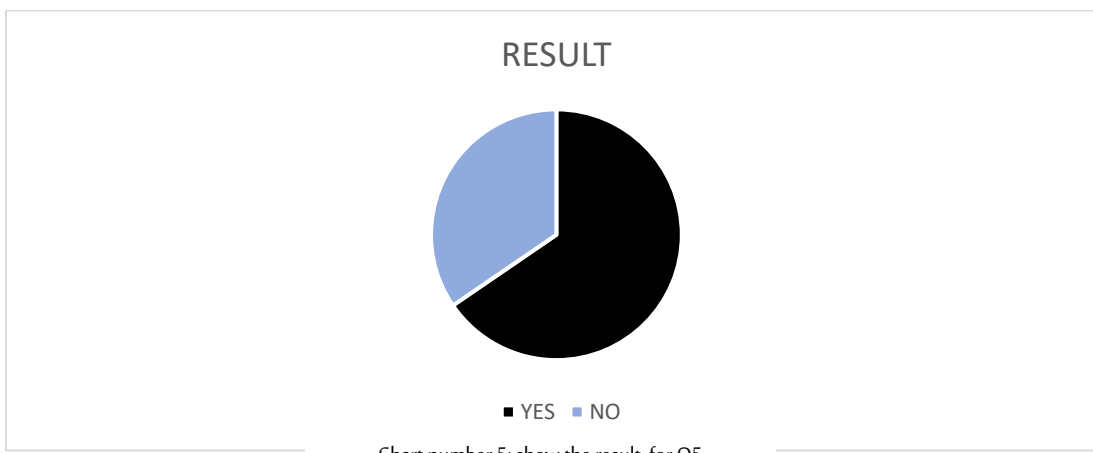


Chart number 4: show the result for Q4

Q5- Do you have concerns about using artificial intelligence in radiology?

<u>YES</u>	<u>36</u>
<u>NO</u>	<u>14</u>

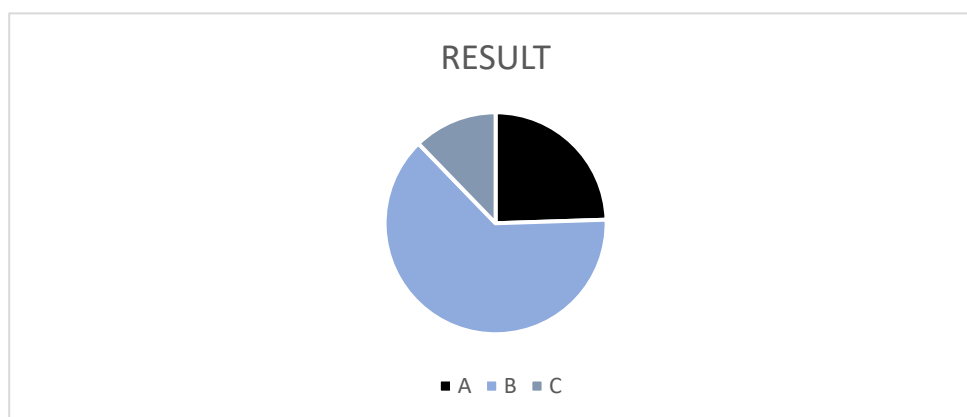
Table: number 8: show the result of Q5



Q6- What are the most common concerns that a specialist/technician/radiologist may face if using artificial intelligence?

	<u>RESULT</u>
<u>A- Dispensing with manpower and using artificial intelligence applications</u>	<u>12</u>
<u>B- Reducing the number of radiology workers</u>	<u>32</u>
<u>C- NOTHING</u>	<u>6</u>

Table: number 9: show the result of Q6



Q7- Do you find that the biggest risks that must be taken into consideration when using artificial intelligence in the field of radiology are security breaches?

<u>AGREE</u>	<u>40</u>
<u>DISAGREE</u>	<u>4</u>
<u>NEUTRAL</u>	<u>6</u>

Table: number 10: show the result of Q7

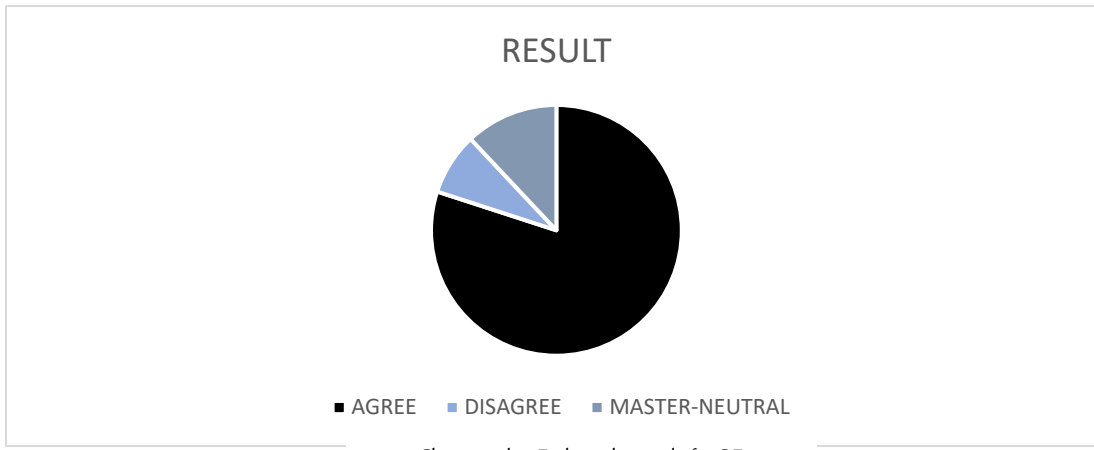


Chart number 7: show the result for Q7

Q8- The use of artificial intelligence may be the safest and most confidential of patient information and data

AGREE	<u>18</u>
DISAGREE	<u>28</u>
NEUTRAL	<u>4</u>

Table: number 11: show the result of Q8

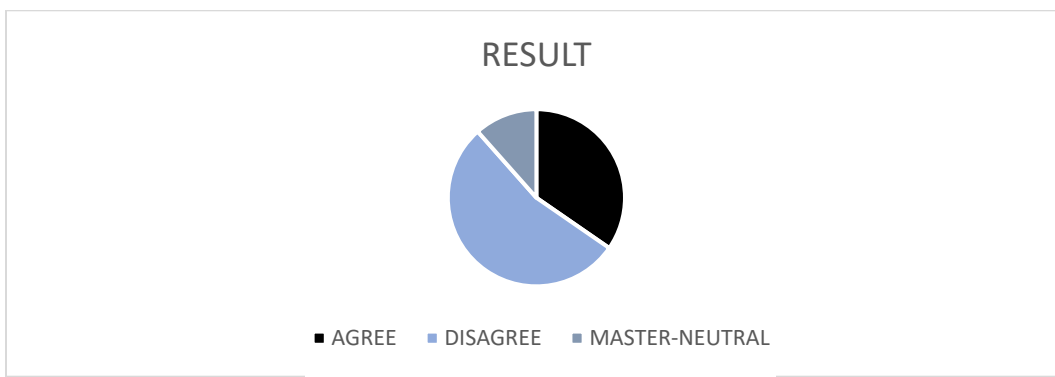


Chart number 8: show the result for Q8

Q9- The use of artificial intelligence saves time and effort in radiological diagnosis.

<u>AGREE</u>	<u>40</u>
<u>DISAGREE</u>	<u>9</u>
<u>NEUTRAL</u>	<u>1</u>

Table: number 12: show the result of Q9

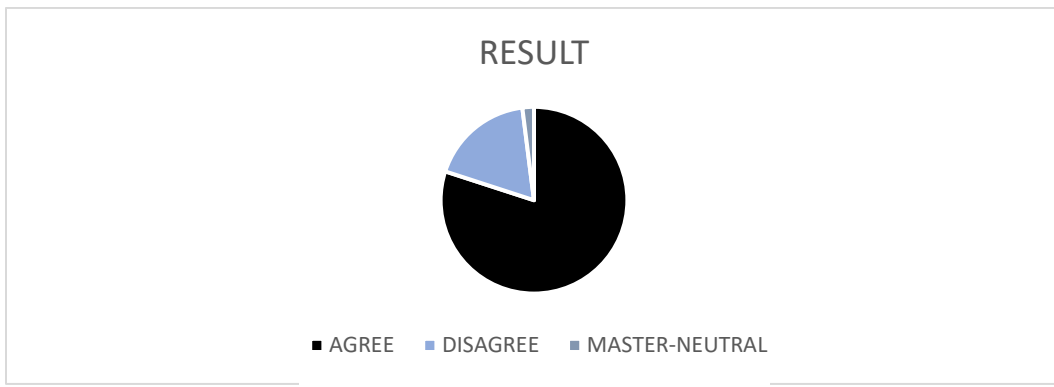


Chart number 9 : show the result for Q9

Q10- the use of artificial intelligence increases the skills of workers in radiological diagnosis.

AGREE	<u>29</u>
DISAGREE	<u>18</u>
NEUTRAL	<u>3</u>

Table: number 13: show the result of Q10

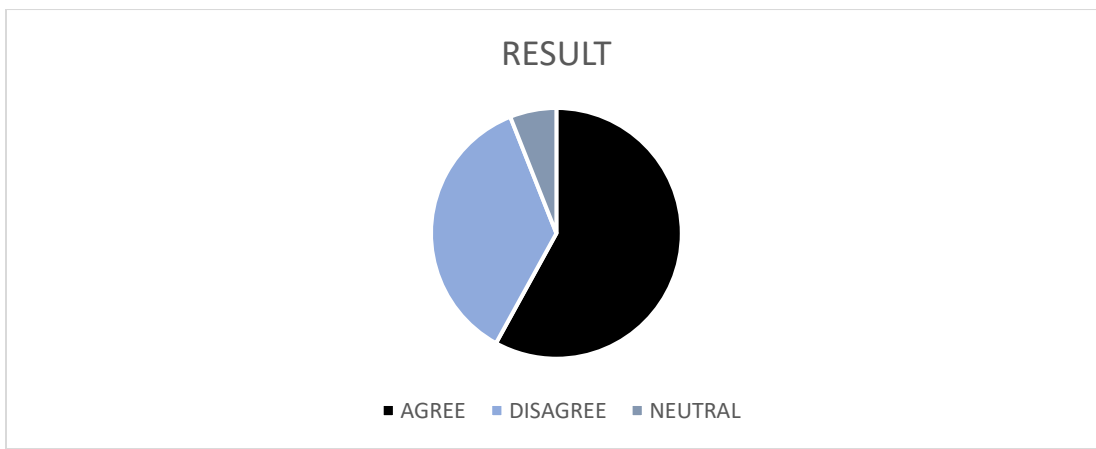


Chart number 10: show the result for Q 10

Q11- The use of artificial intelligence reduces diagnostic errors for workers in the radiology field.

AGREE	<u>38</u>
DISAGREE	<u>5</u>
NEUTRAL	<u>7</u>

Table: number 14: show the result of Q11

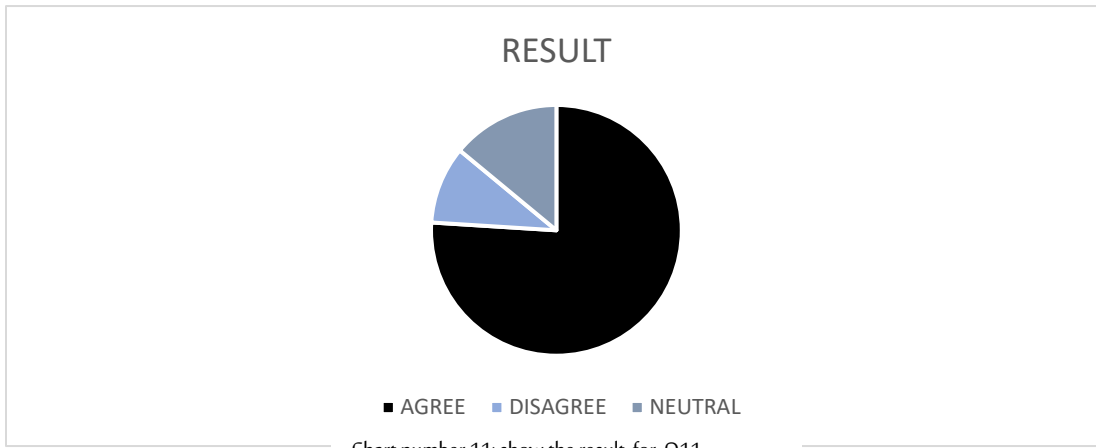


Chart number 11: show the result for Q11

Q12- The use of artificial intelligence has diminished the importance of communication skills in healthcare.

AGREE	<u>36</u>
DISAGREE	<u>5</u>
NEUTRAL	<u>9</u>

Table: number 15: show the result of Q12

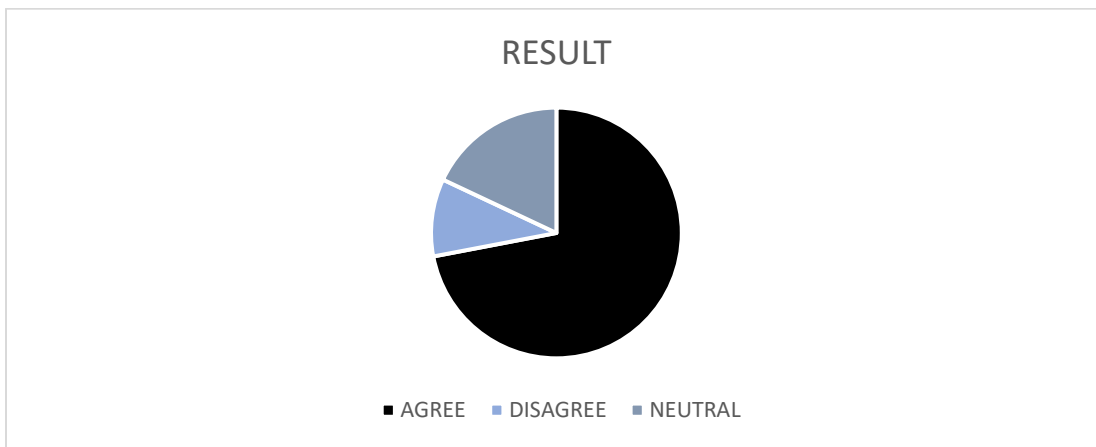


Chart number 12: show the result for Q12

Q13- One of the disadvantages of using artificial intelligence is that it is vulnerable to hacker attacks, power outages, etc

AGREE	<u>48</u>
DISAGREE	<u>0</u>
NEUTRAL	<u>2</u>

Table: number 16: show the result of Q13

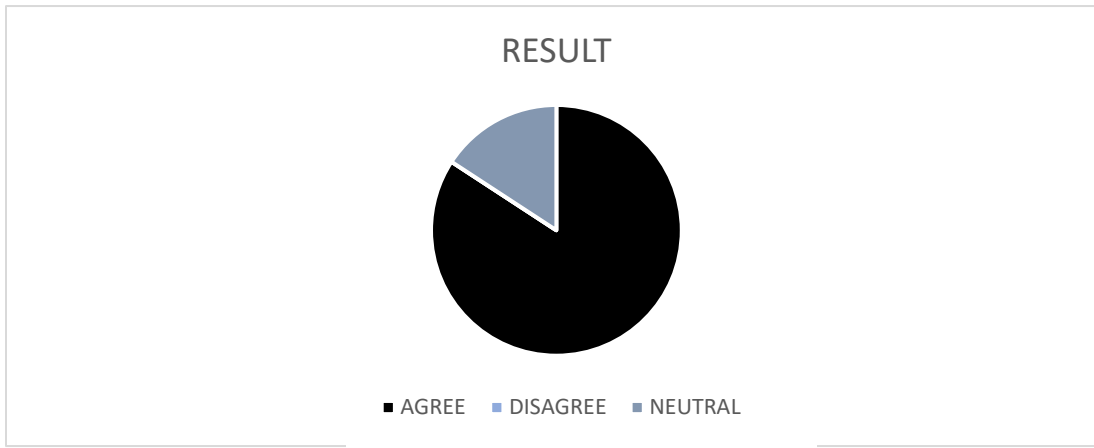


Chart number 13: show the result for Q 13

Q14- Artificial intelligence is the future in transforming practices for radiology staff

AGREE	<u>21</u>
DISAGREE	<u>17</u>
NEUTRAL	<u>12</u>

Table: number 17: show the result of Q14

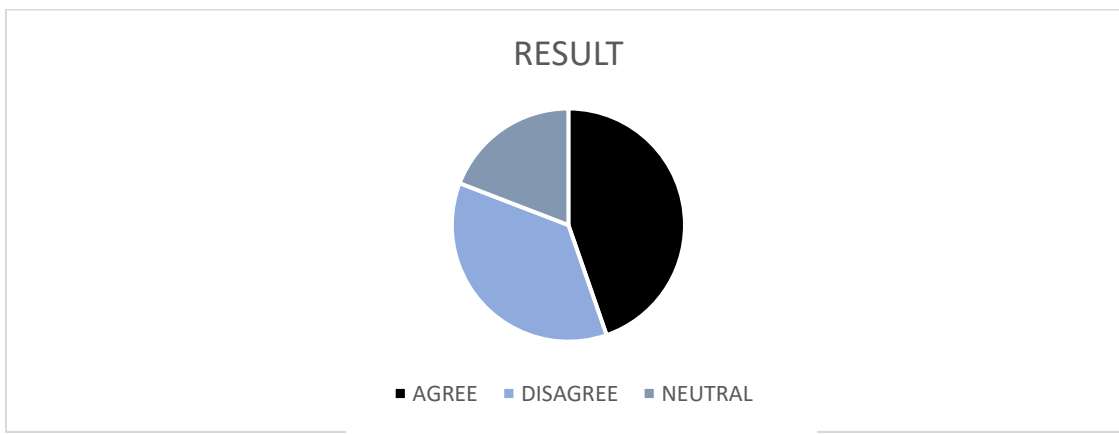


Chart number 14: show the result for Q14

4.2 Research Finding

According to a recent study, 62% of participants were aware of the uses of artificial intelligence in radiology. However, 72% expressed concerns about using this technology in radiology, with 64% worried about it potentially leading to a reduction in the number of radiology workers.

The study also found that 80% of participants considered security breaches to be the biggest risk when using artificial intelligence in radiology. Additionally, 56% disagreed that the use of artificial intelligence may be the safest and most confidential way to handle patient information and data.

On the other hand, 80% of participants agreed that the use of artificial intelligence can save time and effort in radiological diagnosis. Furthermore, 58% agreed that it can increase the skills of workers in radiological diagnosis, and 76% agreed that it can reduce diagnostic errors in the field of radiology.

However, 72% of participants believed that the use of artificial intelligence has diminished the importance of communication skills in healthcare. Moreover, 98% agreed that one of the disadvantages of using artificial intelligence is its vulnerability to threats like hacker attacks and power outages.

Lastly, 42% of participants agreed that artificial intelligence is the future of transforming practices for radiology staff.

1. This study found there are 62% know the uses of artificial intelligence in radiology.
2. This study found there are 72% have concerns about using artificial intelligence in radiology.
3. This study found there are 64% were concerned about when using artificial intelligence, and the result will be Reducing the number of radiology workers.
4. This study found there are 80% of the biggest risks that must be taken into consideration when using artificial intelligence in the field of radiology are security breaches.
5. This study found there are 56% disagreed that the use of artificial intelligence may be the safest and most confidential of patient information and data.
6. This study found there are 80% agree the use of artificial intelligence saves time and effort in radiological diagnosis.
7. This study found there are 58% agree the use of artificial intelligence increases the skills of workers in radiological diagnosis.
8. This study found there are 76% agree the use of artificial intelligence reduces diagnostic errors for workers in the radiology field.
9. This study found there are 72% agree the use of artificial intelligence has diminished the importance of communication skills in healthcare.
10. This study found there are 98% agree One of the disadvantages of using artificial intelligence is that it is vulnerable to hacker attacks, power outages, etc.
11. This study found there are 42% agree Artificial intelligence is the future in transforming practices for radiology staff

4.3 Research Recommendations

Increase the skills of workers to facilitate dealing with artificial intelligence applications

Protection against hackers is crucial for AI users due to network risk.

It is essential to conduct numerous studies on this modern health topic.

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Appendixes

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5.2 Appendix

5.2.1 Poll by using google form



The Impact of Artificial Intelligence on Healthcare: the transformation of the practice of radiology in the kingdom of Saudi Arabia in Riyadh

لقد أصبح الذكاء الاصطناعي مصطلحاً شاملاً للتطبيقات التي تؤدي مهام مُعقدة كانت تتطلب في الماضي إدخلات بشرية و لكن لكل شيء يوجد جوانب مؤثرة و متأثرة ...
لذا أرجوا منكم لمساعدتي في دراستي الماجستير لإدارة المخاطر نأمل منكم تعبئة الاستبيان التالي



haya.al.pnu@gmail.com [تبدیل الحساب](#)

غير مشترك

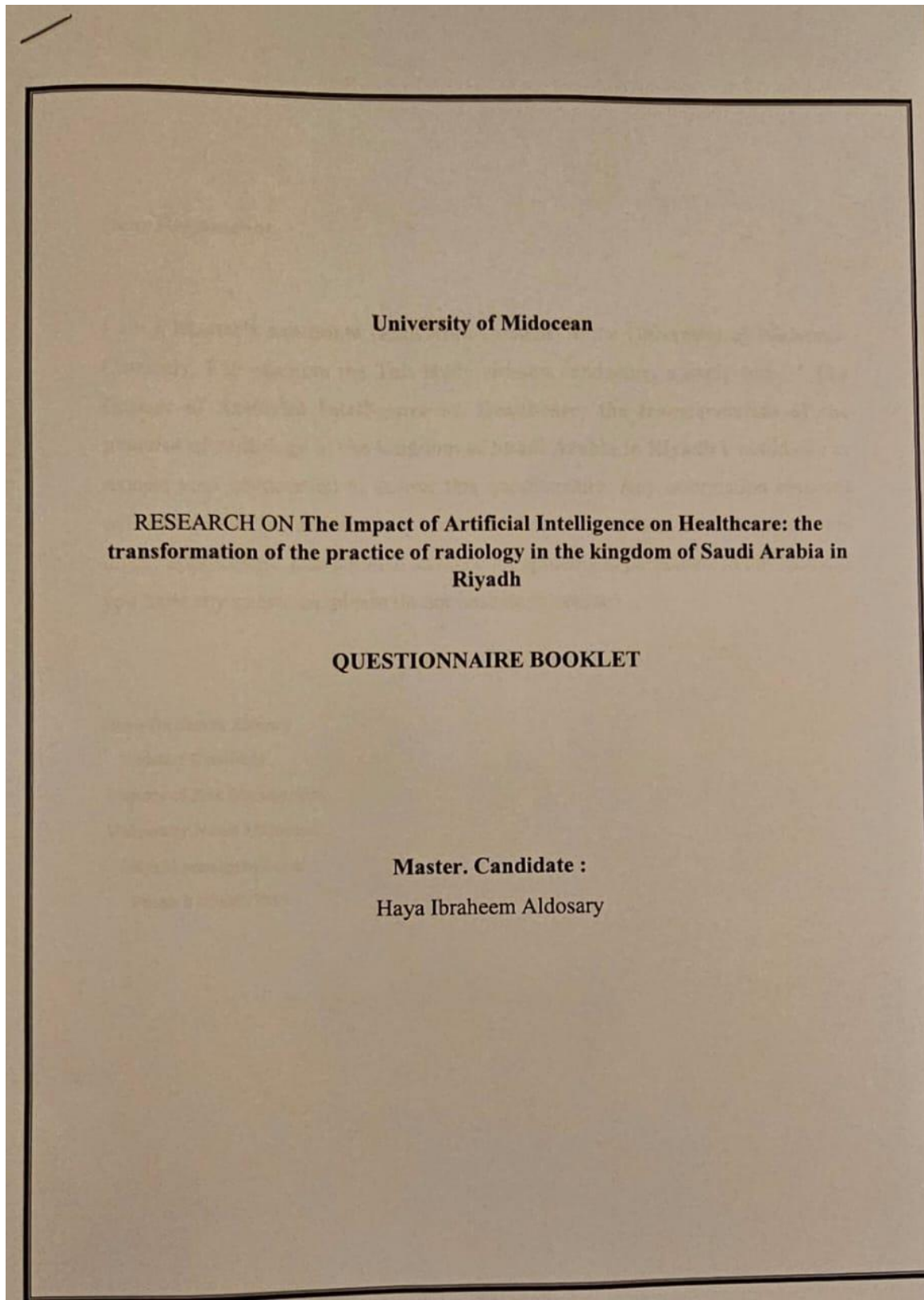
* تشير إلى أن السؤال مطلوب

*

I would like to request your cooperation to answer this questionnaire. Any information obtained will be kept confidential and only used for academic purposes. Your cooperation is highly appreciated

أرجو تعاونكم للإجابة على هذا الاستبيان. أي معلومات تم الحصول عليها ستبقى سرية وتستخدم فقط للأغراض الأكاديمية. تعاونكم للغاية
مُقدَّر

5.2.2 Data sheet



Dear Respondent,

I am a **Master's candidate (Risk Management)** at the **University of Midocean**. Currently, I am conducting a study titled "**The Impact of Artificial Intelligence on Healthcare: the transformation of the practice of radiology in the kingdom of Saudi Arabia in Riyadh**". I would like to request your cooperation to answer this questionnaire. Any information obtained will be kept confidential and only used for academic purposes. Your cooperation is highly appreciated. Thank you in advance for agreeing to participate in this study. If you have any questions, please do not hesitate to contact

Haya Ibraheem Aldosry

Master Candidate

Faculty of Risk Management

University Name Midocean

Haya.al.pnu@gmail.com

Phone # 0598927355

Please tick (✓) the appropriate choice

Q1- Gender:

Male ☐

Female ☐

Q2- Educational:

Diploma ☐

Universal ☐

Master- ABOVE ☐

Q-3 Years of experience

0-3YEARS ☐

5-10 YEARS ☐

11-MORE ☐

Q4-Do you have knowledge about the uses of artificial intelligence in radiology

YES ☐

NO ☐

Q5-Do you have concerns about using artificial intelligence in radiology?

YES ☐

NO ☐

Q6-What are the most common concerns that a specialist/technician/radiologist may face if using artificial intelligence?

Q7-Do you find that the biggest risks that must be taken into consideration when using artificial intelligence in the field of radiology are security breaches?

AGREE ☐

DISAGREE ☐

NEUTRAL ☐

Q8- The use of artificial intelligence may be the safest and most confidential of patient information and data

AGREE ☐

DISAGREE ☐

NEUTRAL ☐

Q9-The use of artificial intelligence saves time and effort in radiological diagnosis

AGREE ☐

DISAGREE ☐

NEUTRAL ☐

Q10-The use of artificial intelligence increases the skills of workers in radiological diagnosis

AGREE ☐

DISAGREE ☐

NEUTRAL ☐

Q11-The use of artificial intelligence reduces diagnostic errors for workers in the radiology field

AGREE ☐

DISAGREE ☐

NEUTRAL ☐

Q12-The use of artificial intelligence has diminished the importance of communication skills in healthcare

AGREE ☐

DISAGREE ☐

NEUTRAL ☐

Q13-One of the disadvantages of using artificial intelligence is that it is vulnerable to hacker attacks, power outages, etc

AGREE ☐

DISAGREE ☐

NEUTRAL ☐

Q14-Artificial intelligence is the future in transforming practices for radiology staff

AGREE ☐

DISAGREE ☐

NEUTRAL ☐

5.3 English Abstract

In this study, we aim to determine the impact of Artificial Intelligence (AI) on the healthcare, specifically its potential to transform radiology practice In the Kingdom of Saudi Arabia In Riyadh at the X-ray Department in King Saud Medical City. We will also investigate how the use of AI can increase the risk in healthcare, and to what extent it affects the industry. Additionally, we will identify the most significant risks of using AI in healthcare and evaluate their impact on the transformation of radiology practice.

5.4 Arabic Abstract

في هذه الدراسة ، نهدف إلى تحديد تأثير الذكاء الاصطناعي (AI) على الرعاية الصحية ، وتحديدًا على تحويل ممارسة الأشعة في المملكة العربية السعودية في الرياض في قسم الأشعة السينية في مدينة الملك سعود الطبية. سنحقق أيضًا في كيفية استخدام الذكاء الاصطناعي وإمكانية أن يزيد من المخاطر في مجال الرعاية الصحية ، وإلى أي مدى يؤثر ذلك ، سنحدد أهم مخاطر استخدام الذكاء الاصطناعي في ممارسات الأشعة