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# Inspiration from the past to embrace the potential future of Artificial Intelligence (AI) in Radiology: An Islamic Perspective

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## Abstract

**BACKGROUND:** Technological advancements in healthcare have resulted in improvements in hospital workflow, more accurate disease prediction and shaped patient engagement, personalising patient experiences. At the forefront of these advances is Artificial intelligence use in radiology (a field which has frequently led the way for digital healthcare evolution), which uses algorithms to efficiently analyse large data sets. However, the Muslim world has been slow to embrace technological developments and in particular AI, sparking the debate between "modern liberalism and Islam". This review subsequently explores the benefits to society from studies looking at AI in radiology from an Islamic perspective and studies examples of renowned past Muslim scientists and pioneers with developments that shaped the medical field.
**METHODOLOGY:** Literature on past Islamic medical pioneers was examined and compared to the present day uptake of AI in radiology, by Muslim populations. The literature review was analysed from an Islamic perspective using usul al-fiqh, Hadith and tafsir.
**RESULTS:** Studies examining the use of AI in radiology show AI can assist radiologists via reliable automated recognition of complex imaging patterns, providing second opinions - minimising rate of diagnostic errors, time-saving and reduction in workload burden. This is increasingly important post-pandemic where radiologists are met with a backlog of cases, but few added resources. Inspiration for Muslims to embrace AI is taken from multiple medical pioneers surfacing in the Islamic golden era, including AlKhwārizmī whose name yielded the words "algorithm" and "algebra".
**CONCLUSION:** This review highlights key Islamic principles which are satisfied by AI including the benefits to society of AI in radiology, which align with the Islamic duty of helping people. Meanwhile, the Islamic principle of acquiring knowledge also supports AI advances and these are reflected in examples of notable past Muslim scientists and pioneers with developments that shaped the medical field. Subsequently, there is a strong incentive for Muslim populations to consider case studies of scientific pioneers in Islamic history as stimuli on a micro-level to embrace AI advances in fields like Radiology.

## Background

Technological advancements in healthcare have resulted in improvements in hospital workflow, more accurate disease prediction and shaped patient engagement, personalising patient experiences(1). At the forefront of these advances is Artificial Intelligence (AI) use in Radiology (a field which has frequently led the way for

digital healthcare evolution), which uses algorithms to efficiently analyse large data sets(1, 2). However, the Muslim world has been slow to embrace technological developments and in particular AI, sparking the debate between "modern liberalism and Islam"(1).

This review explores the benefits to society from studies looking at AI in radiology from an Islamic perspective and studies examples of renowned past Muslim scientists and pioneers with developments that shaped the medical field.

## Methodology

Literature on past Islamic medical pioneers was examined and compared to the present day uptake of AI in radiology, by Muslim populations. The literature review was analysed from an Islamic perspective using usul al-fiqh, Hadith and tafsir.

## Results

**Inspiration from Islamic Pioneers in Science, Medicine and Technology**

The Islamic Golden Age between the period of 6th-13th century was a time of Islamic excellence, where numerous muslim physicians, scholars and scientists amongst other muslim pioneers made significant discoveries and advancements in the fields of science, medicine and technology and established the groundwork for present day robotics and artificial intelligence(3).

Al Jazari frequently termed 'the father of robotics' was an example of a highly influential 12th century Islamic Golden Age pioneer and Turkish muslim mechanical engineer who contributed greatly to AI and robotics. He achieved this through the construction of a programmed humanoid robot, the invention of the first mechanical clock, creation of the famous weight-driven elephant water clock and an automated hand washing apparatus, along with several other inventions during his lifetime(3-5). Al Jazari is therefore considered one of the most important Islamic engineers of the Middle Ages.

Another eminent innovator from the Islamic medieval period was Al-Razi. A 9th century physician, chemist, and philosopher in Baghdad who wrote on a wide array of topics, which included medicine and pharmacology and developed theories on the use of drugs to treat various illnesses(6). Al Razi made noteworthy advancements on our understanding of Measles and Small-Pox through his written piece "A Treatise on the Small-Pox and Measles," where he distinguished the two as separate diseases(7).

Abu al-Qasim al-Zahrawi was an Arab muslim surgeon practicing between the 10th and 11th century, occasionally labelled the "Father of Operative Surgery" was renowned by his expert surgical knowledge and contributions to the field of surgery through his development of various surgical instruments which included scalpels, cauterization and forceps which are still used today(8, 9).

One of the most famous Islamic pioneers was Ibn Sina (Avicenna). He was a physician, Islamic intellectual and a scientist and wrote on Medicine extensively, his writing including the book "*al-Qanun, fi al-Tibb*or" translated as "The Canon of Medicine", frequently referred to as one of the most famous medical textbooks ever written(10). The book was regarded as the standard medical textbook for centuries(10).

The Banu Musa brothers (Muhammad ibn Musa al-Khawarizmi, Ahmad ibn Musa, and al-Hasan ibn Musa), were 9th century scholars of the 9th century from Bagdad who between them made important contributions to mathematics including algebra, trigonometry and bringing the decimal point and arithmetic to the west, with Muhammad ibn Musa al-Khawarizmi being termed 'the father of algebra', and his name yielding the words "algorithm" and "algebra".They also made contributions to astronomy introducing concepts like astrolabe, and to automata where they wrote a book titled "*Kitab al-hiyal*" translated to "The Book of Ingenious Devices" and shaped the development of mechanical sciences in Islam(11, 12).

In this way emergence of multiple pioneering health technology innovations in the Islamic medieval times lead to advancements that have paved the way for modern medical practices, that are still in use today.

**Embracing Artificial Intelligence in Radiology from an Islamic perspective**

The innovative stream in medicine, science and technology from the Islamic world has slowed over recent years for a number of deliberated reasons (3). However, taking inspiration from the pioneers of Islam's golden age can prompt muslims to once again take an active role in scientific innovations like AI to advance healthcare and promote Islamic values.

From an Islamic perspective, the potential of AI in the field of radiology is immense. AI has the potential to

bridge the supply-demand gap of radiologists allowing radiologists to interpret scans more quickly(13).This is increasingly important post-pandemic where radiologists are met with a backlog of cases, but few added resources.As well as assisting radiologists in providing more accurate and complete diagnoses for patients, minimising the risk of misdiagnosis enabling better patient outcomes(14).

The use of AI in radiology could also improve patient safety and reduce the risk of medical errors(15). AI can detect subtle changes in a patient's medical images and alert medical professionals to potential medical issues that may otherwise be missed(16).

AI also has the potential to reduce the workload of radiologists, allowing them to focus on more complex cases(17). This could lead to more efficient patient care and better outcomes for patients.

The most important aspect of the use of AI in radiology, however, is its potential to save lives. AI could be used to detect early signs of cancer, reduce the risk of adverse events caused by radiation exposure, and improve the accuracy of diagnosis(16).

Subsequently, the use of AI in a medical field like radiology reflects core values of Islamic belief which include seeking new knowledge and using this positively to help improve the lives of others. By leveraging AI technology to improve the accuracy and speed of diagnosis, we can reduce suffering and improve the quality of life of patients. This is a value that is at the core of Islamic teaching and should be embraced by all medical practitioners.

## Conclusion

The golden age of Muslim pioneers in health technology was a period of great innovation and progress in the Islamic world. These great scientific scholars made significant contributions to the advancement of medical sciences and their work has had a lasting impact on the world of medicine. Subsequently there is a strong incentive for Muslim populations today to consider case studies of scientific pioneers in Islamic history as stimuli on a micro-level to embrace AI advances in fields like Radiology, which has the ability to significantly improve quality of care for patients, upholding the Islamic duties of acquiring knowledge and helping people.

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