Radiology in modern economics - business as usual?

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Abstract

Until now the author could identify three components to be critical to a well-functioning radiology system:

1. The radiological self-perception and perception by others as a discipline.
2. The radiologist as a human being.
3. Depending on where the respective radiology department is located, the financial resources of radiology are very variable.

It is consensus in the medical community that radiologists play a key role in the diagnosis, treatment, and protection of patients [1]. In the past, various societal changes have led to a decline of reimbursement for radiological procedures and reductions in the quantity and quality of output. So-called demedicalization trends in radiology departments are taking place [2]. To make radiology fit for survival, several measures and strategy changes should be observed in the future. As we have learned from the various financial crises over the past 30 years, most western economies are driven primarily by profit maximization and ultra-rapid return on investment, leading to major inequalities in the distribution of wealth and health in society [3]. Will this be still acceptable in the future? Can radiology continue as it has been over the last decades? Business as usual? Will there be a significant financial deterioration in health system resources in the future, that will impact radiology negatively? To attempt to answer these questions, possible strategies for the survival of radiology as an independent discipline are discussed.

Keywords: financial crisis, demedicalization, reimbursement of radiology, health care, centrality in patient care

Background

Until a few decades after the discovery of the X-rays by Wilhelm Conrad Röntgen in 1895, Radiology as a medical discipline was inexistent. The use of X-rays for diagnosis and therapy was pioneered by interested individuals who could see the potential value of the newly discovered type of ionizing radiation, often physicians, surgeons, and physicists [1].

It took several decades for radiology to split into diagnostic radiology, radiotherapy, and nuclear medicine, giving birth to separate specialties that have had a lasting impact on healthcare to this day. Due to the rapid development of microchip technology from the 1990s until today, radiology as a discipline has experienced enormous improvements. It was the ever-faster computers that made it possible to digitize radiological information in the first place. The development of ultra-high-field MRI and super-fast CT scanners was made possible. Instantaneous high-resolution reconstructions of cross-sectional images and endoscopy-like virtual

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imaging created more direct clinical reference. Recently, there are radiological image analysis tools based on artificial intelligence that are slowly but surely finding their way into everyday clinical practice. It should also be mentioned that since last year (2022), report writing in radiology can be supported by artificial intelligence-driven report text tools such as ChatGPT [4]. Radiology with all its wide spectrum of imaging techniques has now become a central component of multidisciplinary decision-making in clinical standard of care [5]. In an environment of repeated financial crises and global economic instability over the last decades, it is very difficult for the respective health systems to deal with the measures imposed by policy. Most of the time, these measures are budget cuts and additional other far-reaching regulatory changes that do not always affect the respective health system as originally planned [3] [6] [7]. Of course, it affects the cost-intensive parts of the respective health systems first and foremost. Thus, the very technical and therefore expensive discipline of Radiology is one of the first target points when it comes to potential savings.

Until now there can be identified three major components among others to be critical to a well-functioning radiology system

- Radiology views itself as an independent, self-aware, and self-confident discipline
- Radiologist as a human being
- Economic environment

1) Radiology as an independent discipline with confident self-awareness:
Imaging has become essential to managing various disorders to ensure the continuum of care in the definition of the World Health Organization [8] (WHO) concept, ranging from primary prevention, timely detection, and diagnosis to treatment and post-therapy rehabilitation or palliative care [1]. Radiological imaging provides detailed information about structural or disease-related changes in the human body. The ability to use imaging techniques to detect diseases at an early stage can save patients. Thus, radiology ultimately saves lives. It is indispensable for general medical care [2] [9]. As an example of the importance in the medical treatment chain, we can look at the distribution of MRI scanners in different countries around the world. As shown in Table 1, there is a very large imbalance between the so-called rich and poor countries respectively. Japan shows the highest density of MRI scanners in relation to population, while Morocco has the lowest number of devices [10].

Country	MRI-Units / Million Inhabitants	GDP Billion USD
Japan	51,67	4,941
USA	38,96	23,320
South Korea	26,47	1,811
Spain	15,30	1,427
France	12,59	2,958
Portugal	9,90	0,258
Turkey	9,81	0,819
Saudi Arabia	9,70	0,834
New Zealand	9,62	0,250
Canada	9,48	1,988
Qatar	9,22	0,180
Serbia	6,20	0,064
Libya	5,16	0,043
Israel	4,21	0,489
Uruguay	2,94	0,059
South Africa	2,90	0,419
Mexico	2,25	1,273
Tunisia	2,00	0,047
Egypt	2,00	0,404
Morocco	0,36	0,143

TABLE 1: Distribution of MRI units in selected countries

Focusing on technical developments is one of the ways to improve the quality of diagnostics and treatment without wasting resources. Radiology sees itself as a self-confident, interdisciplinary science that combines its expensive equipment, the corresponding commercial challenges, clinical demand, and legal requirements in such a manner that the patient can receive the best possible therapy.

2) Radiologist as a human being:
Over the past 30 years, the centrality of radiology in patient care and the impact (immediate and long-term) of radiology in healthcare, have both grown substantially [1].

Multifunctional beings:	Duties = know how to:
Clinical doctors	Clinical knowledge of referring disciplines
Protectors for patients	Know how to select the right imaging modality following the ALARA-principle (= keep radiation "as low as reasonably achievable")
Communicators	Networking and promoting diagnostic information
Innovators and scientists	Beta-testing of new methods until common use
Teachers	Transmitting the spirit and the motivation to empower younger generations of radiologists "*...to boldly go where no man has gone before...*"
Human beings	Know how to stay humble, natural, and kind even in hard times
TABLE 2:	**Inherent duties of radiologists as defined by the author without claiming completeness**

The increasing demand for imaging can lead to radiologists being overburdened with work, with the risk that the radiologist's clinical knowledge and skills may no longer be visible and perceived by others [1]. The role of the radiologist nowadays is to report imaging findings and contribute to multidisciplinary management teams equal to the other members, specifically at the start of any therapeutic journey. Multidisciplinary meetings such as tumor boards or consensus conferences enable a synthesis of all aspects of social, imaging, and clinical information about the patient. In this way, an informed decision proposal can be made for an individualized treatment plan. In sight of this background, the advantages of a high level of knowledge and sub specialized service provision by radiologists working exclusively in their sub specialty become even clearer [1, 2]. Radiologists should take every opportunity to share their knowledge with medical students, radiology trainees and colleagues from other specialties and other professions. Furthermore, radiologists are also clinicians. Of course, they are also in a responsible position as communicators, innovators, and radiation protectors. At this point it is worthful thinking about that even in difficult times one should remain humble, natural, and friendly as a human being. As doctors, we owe that to our patients.

3) Economic environment

There is a consensus in the literature [1, 2, 9, 10] that radiology is a very expensive discipline. This concerns both the acquisition of the required technical equipment and its maintenance. The needs analysis of a diagnostic radiology department is usually based on available data, which includes aspects such as medical and non-medical manpower. In other words, without enough money, a state-of-the-art radiology department cannot be realized. Of course, there are many ways of spending money in a Radiology Department, but what is the easiest way to achieve the best possible performance in radiology with the least possible economic effort? This question is subject to constant debate and has been discussed by many experts for decades. There is no clear and concise answer to that question. Just as in many other medical disciplines, personnel costs are a big factor that makes those in charge feel covetous time and again. To be able to reduce radiological personnel the role of artificial intelligence (AI) assisted image analysis is, therefore, much more significant than ever. All tides are shifting toward more autonomous and accurate AI-assisted imaging models while saving costs [4]. This results in a development which is called demedicalization [2], which means less expensive medical staff needed. Financial resources as a measure of radiology services will become more and more important in the future because it enables decision makers to weight the relevance of radiology as well as the radiologist within the treatment process. Put simply, the more expensive the radiology is equipped and the more highly qualified the radiologists are, the better their overall performance and thus the better for the patient. Unfortunately, this simplified statement is not always true. Just as there are calibrated predictive or quality control models for the entire health system, there should also be uniformly accepted benchmarks for radiology. More studies are needed on this. There is evidence that health systems are open systems of high complexity with multi-factorial variables and sometimes chaotic seeming properties [11]. In our opinion, radiology is part of this complexity and thus reflects the state of a living being that is constantly evolving to survive in a changing economic environment. As long-time experts of the radiology scene will confirm, the structural and financial difficulties of the crisis-ridden health system are thus constant and well-known companions of the last decades. We are confident that radiology will continue to be needed in the future. So, in a sense one can tell - business as usual.

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