

Preface

Special Issue – Image Quality and analysis in Diagnostic Radiology

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1. Introduction

Since the discovery of X-rays by Wilhelm Conrad Roentgen in 1895, we assist to an amazing growing and development of radiology field, namely in diagnostics, interventional procedures, therapy and follow-up of diseases[1]. The remarkable progress of Medical Imaging during the twentieth century has become essential in clinical practice allowing the development and use in new areas of great importance, such as molecular biology, biomedical research and therapeutic noninvasive intervention radiology[2, 3, 4].

The improvements of digital imaging systems and increasing use for medical purposes have brought to radiology professionals new responsibilities. In contrast to image acquisition and visualization, the radiologic technologist has extended their role to other areas: image analysis and management[1]. For the reason, to realize these steps, it is important to understand the different natures of medical images and imaging modalities. The large variety of imaging modalities are based on transmission, reflection or refraction of light, radiation, temperature, sound or spin, which emphasizes these differences in image characteristic with respect to the imaging modalities.

With improved health care programs and growing of the availability of the medical equipment, the number of radiological medical procedures increased considerably, and therefore the diagnostic radiology is invaluable for the health care[4]. Effective and good quality imaging is important for further medical decision and can reduce unnecessary procedures and risks; furthermore, concerning ionizing imaging modalities the radiation protection of the patient becomes an important issue that must be considered.

This special issue intends to explore and describe topics of primary interest related with *Image Quality and analysis in Diagnostic Radiology*, such as:

1. Medical imaging modalities and clinical applications (especially radiography and computed tomography – CT);
2. Medical image analysis (e.g., pattern recognition, classification, and segmentation) of lesions, lesion stage, organs, anatomy, status of disease, and medical data;
3. Image Quality Measurements in Radiology;
4. Quality Control Programs;
5. Patient radiation dose.

2. Special Issue Content

This special issue received five manuscripts from which 2-3 reviewers each have accepted four, after a careful assessment by blind-revision. All these paper are focused in image quality control and assessment. Image Quality Control is an important factor that contributes to the improvement of patient care and overall diagnostic accuracy.

The relevance of this topic is remarkable, in particular for X-ray imaging modalities, such as radiography and CT, where patient radiation dose and protection must be balanced with high image quality standards.

In the first manuscript the authors intend to determine if the CT diagnostic image, meets the quality criteria previously established for head CT exams. The authors verified the existence of a large number of *non-conform* head CT studies, but these can be corrected by means of the development of quality control programs that focus on the same goals and to the clinical institution.

A similar purpose for digital radiographic images is described in the second manuscript. Concerning the quality of radiological images and management, the majority of studies performed are related with radiological equipment quality control and to assess their functionality. Thus, this study focuses on the need to accurately assess the images produced on 3 radiographic exams (chest, abdomen and foot x-rays) and if these images have enough quality to be used in a clinical diagnosis.

The third manuscript intend to demonstrate the importance of CT in healthcare quality and safety by means of a literature review based on 73 articles that address the concepts of dose reduction. The findings of this study acts as a point of reflection on the determination of dose radiation concepts and specially its relevance for CT examinations.

Finally, the fourth manuscript aims to verify if the volume of iodinated contrast medium in abdominal CT based on lean body weight allows a good liver enhancement. With the development of multidetector CT equipment, large volumetric acquisition can be achieved in a small fraction of time. This technical advance allowed the development of double-head injectors, changing the abdominal CT imaging protocol and diagnosis. Diagnostic accuracy of abdominal CT examinations can be improved according to the liver enhancement method but the dose of iodinated contrast medium can differ among patients.

3. Future Trends and Challenges

It is expected that the demand for radiology services will continue to rise due to the global increase of illnesses, the increase of aging people and the growth of industrialization and healthcare programs[5]. Thus, there is a notable trend in the increasing frequency of use of advanced modalities such as magnetic resonance imaging and interventional radiology procedures, but a relatively unchanged level of use of radiography.

An increasing amount of radiology-related work is being done by other specialties such as vascular and gynaecology ultrasound, vascular intervention or cardiac imaging. The role of radiology professionals in modern health systems is changing[6].

Concerning radiologic technologist future, the diversity of imaging modalities and great advances in technology and image processing will require specializations in order to improve image quality standards and subsequently, provide better healthcare.

ACKNOWLEDGMENTS

The Guest Editor and the authors express their appreciation to the anonymous international reviewers, who have been instrumental in the peer-review process for the manuscripts submitted to this special issue.

REFERENCES

- [1] T. M. Deserno, *Biomedical Image Processing*. Springer Berlin Heidelberg, 2011.
- [2] B. Hillman, "The Past 25 Years in Medical Imaging Research: A Memoir," *Radiology*, vol. 214, no. 1, pp. 11–14, 2000.
- [3] S. Chan, "Radiology The Importance of Strategy for the Evolving Field of Radiology," *Radiology*, vol. 224, no. 3, pp. 639–648, 2002.
- [4] A. Margulis and J. Sunshine, "Radiology at the Turn of the Millennium," *Radiology*, vol. 214, no. 1, pp. 15–23, 2000.
- [5] R. Mohd-nor, "Medical Imaging Trends and Implementation: Issues and Challenges for Developing Countries," *Journal of Health Informatics in Developing Countries*, pp. 89–98, 2011.
- [6] A. Parekh and S. Gandhi, "Radiology: Opportunities and Challenges," *West of England Medical Journal*, vol. 110, no. 3, p. 1, 2011.