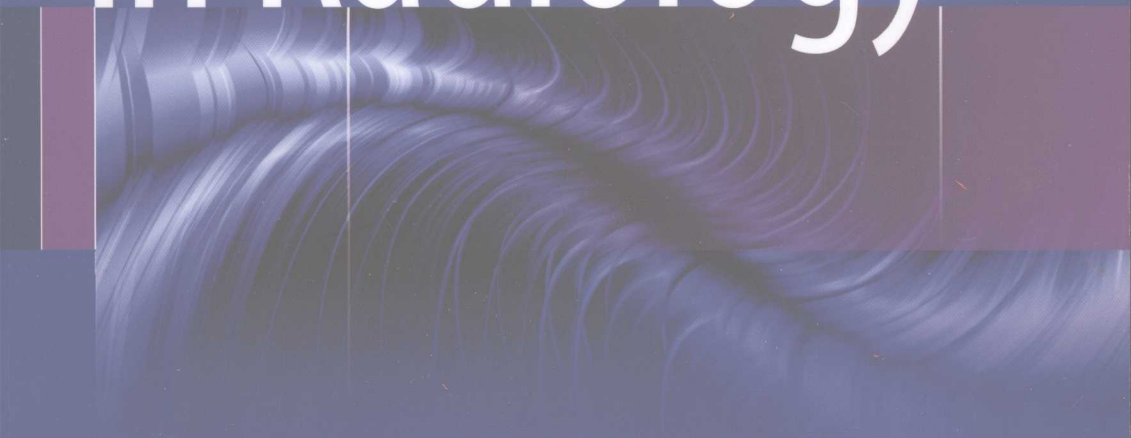
Errors in Radiology



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Preface

Errors in medicine have become headline news in recent years, and legal action against physicians for alleged malpractice is an increasing problem in all industrialized countries and in all specialties. Radiology has not been immune to these events. Moreover, many of its unique aspects make radiologists particularly vulnerable, due to the inherent characteristics of the discipline and its latest developments, which together call for careful assessment of the images produced by increasingly sophisticated imaging modalities.

Mistakes are unavoidable. As health-care professionals, we must admit that they can happen, but, once discovered, make sure they are not repeated. The study of errors provides the necessary foundation for radiologists to apply professional standards and exercise personal ability, as well as responsibility, to improve the quality of their own work and that of their department.

Diagnostic errors fall into recurrent patterns. Error traps need to be uncovered and highlighted in order to prevent repetition of the same mistakes.

The purpose of this book is to discuss and illustrate many of the errors occurring in radiology practice. The 28 chapters cover a large spectrum of diagnostic errors and present a wide series of cases related to diagnostic errors involving plain film, ultrasonography, computed tomography, magnetic resonance, and angiography studies. In addition, medico-legal issues related to Interventional Radiology, radiology reporting, child abuse, foreign bodies, body-packing, and contrast medium administration are addressed.

A culture of safety must be developed within radiology departments such that whenever we come across an error made by a colleague, we bring that error to his or her attention in a sensitive and constructive manner. At the same time, it is essential that radiologists and radiology departments continue to improve the process of recording and addressing errors.

The expertise, breadth of knowledge, and thoroughness conveyed by the authors of this volume provide a valuable source of information on the spec-

trum of potential errors in radiology. We hope that this book will allow radiologists to reduce the rate of errors in their work and to improve the quality of their departments.

April 2012

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Antonio Pinto, Maria Giuseppina Scuderi, and Stefania Daniele

1.1 Introduction

As indicated by the title of the landmark report of the Institute of Medicine, "To Err is Human" mistakes are part of the human condition [1]. They cannot be prevented by trying harder. At best, systematic changes are needed to prevent physician's from doing the wrong thing while making it more likely that they will do the right thing. This is accomplished by hardwiring functions into medical systems and providing information at the point of care [2].

There are four health-care-related factors contributing to medical errors that can lead to patient harm: (1) human fallibility, (2) complexity, (3) system deficiencies, and (4) a vulnerability of defensive barriers. All of these must be addressed to significantly improve patient safety [3].

Errors in medicine have become headline news in recent years, and legal action against physicians for alleged malpractice is an increasing problem in all industrialized countries and in all specialties.

Radiology is not immune to this phenomenon and presents a number of unique features linked to both the inherent characteristics of the discipline and its latest developments, which call for careful assessment [4].

Diagnostic radiology must aim for the complete detection of all abnormalities in an imaging examination and their accurate diagnosis [3].

It offers a presumptive rather than a histological or microbiological diagnosis and diverges from the normal path of other medical specialties, in that it depends entirely on visual perception and on the identification of specific characteristics on a radiograph. Mechanical, physiologic, and psychological factors contribute to an intricate diagnostic interplay that has yet to be fully

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appreciated [5]. Yet, it is clear that the technician and radiologist can perform their jobs in a more efficient and focused manner if physicians have provided adequate clinical information to the radiology department [5].

Diagnostic error in radiology is an important topic, with both medico-legal and quality control implications. To improve diagnostic accuracy, it is imperative to understand the nature and source of diagnostic errors. Traditionally, the study of radiological errors was limited to errors in radiologists' reports, often out of context of the whole diagnostic episode and omitting the integral role of referring physicians. Radiological investigation begins at the point of clinical suspicion of a condition, and ends with the receipt of the radiologist's opinion by the treating team. Radiologists become personally involved only after a request has been initiated and the desired images acquired, but these two stages also generate diagnostic errors that affect the episode's outcome.

Radiological problems that have led to medical malpractice lawsuits most frequently have been due to "failure to diagnose." The three main categories of claims are misdiagnoses, complications, and miscellaneous [6, 7]. Diagnostic errors often go unrecognized or unreported and may be associated with high patient morbidity. But malpractice lawsuits have adverse effects on a physician's health because physicians who have committed a severe error can experience an abrupt change in the quality of life and an increased frequency of burnout [8].

1.2 Definition of Error

The issue of patient safety plays a prominent role in health-care. Its prominence is fueled by an expanding body of literature that shows a high incidence of error in medicine [9-11] coupled with well-publicized medical error cases that have raised public concern about the safety of modern health-care delivery. Historically, patient safety researchers investigating the impact of medical error have adopted outcome-dependent definitions and surrogate terms, while limiting their focus to patients experiencing adverse outcomes or injury as a consequence of medical care [1-3]. Perhaps this tendency stems from the guiding principle of medical practice, credited to Hippocrates, *prium no nocere* ("First, do no harm") [12]. Moreover, the manner in which patient safety has been defined promotes an outcome-dependent approach to defining medical error.

In the 1990s, the publication of the three most extensive investigations on medical error – the Harvard Medical Practice Study [9, 10], the Quality in Australian Health Study [11, 13], and the Utah and Colorado Medical Practice Study [14] – gave prominence to the term "adverse event" defined as an unintended injury to patients caused by medical management (rather than the underlying condition of the patient) that results in measurable disability, prolonged hospitalization or both [9, 10, 14]. Alternatively, an adverse event can be considered as an unintended injury or complication that results in disability, death, or prolonged hospital stay and is caused (including acts of omission

and acts of commission) by health-care management rather than the patient's disease [11].

Definitions of medical error in the published literature include:

- The failure of a planned action to be completed as intended (an error of execution), or use of the wrong plan to achieve an aim (an error of planning) [15];
- An unintended act (either of omission or commission) or one that does not achieve its intended outcome [16];
- Deviations from the process of care, which may or may not cause harm to the patient [17].

But what is an error in radiology? An error is a deviation from the expected norm, regardless of whether it results in any harm. Errors may be categorized in a variety of ways and we have methods in place to facilitate their identification so that steps can be introduced to minimize their occurrence. In addition, medical errors can be further classified in terms of the outcome or harm suffered by the patient, if any, allowing assessment of the episode and the proper assignment of accountability [18].

In broad terms, factors contributing to errors are categorized as being system-related (latent errors) or person-related (active errors). The latter are human cognitive errors and are thus more likely to be preventable but also more likely to have an adverse outcome than technical errors. As applied to diagnostic radiology, three main categories of error are responsible for the majority of "missed" or misinterpreted observations on radiological examinations: technical (latent or system-related), active (errors in perception, knowledge, and/or judgment), or a combination thereof [18].

1.3 Classification of Errors in Radiology

In order for a radiologist or any other physician to be found liable for medical malpractice, four elements must be established. There must be a radiologist–patient relationship, the radiologist must have committed a negligent act (a breach of the standard of care), the negligent act must have caused injury to the plaintiff–patient (proximate cause), and the patient must have sustained an injury [19]. In general, there are four main reasons why radiologists are sued: (1) observer errors, (2) errors in interpretation, (3) failure to suggest the next appropriate procedure, and (4) failure to communicate in a timely and clinically appropriate manner [5].

1.3.1 Observer Errors

Kundel et al. [20] described the following types of observer error: scanning error, recognition error and decision-making error. The first results from failure of the radiologist to fixate on the area of the lesion.

Recognition error involves fixating on the territory of the lesion yet failing to detect the lesion, while decision-making error is the incorrect interpretation of a malignant lesion as a normal structure.

Another form of observer error that may contribute to lesions being overlooked is satisfaction of search (SOS) error [21]. An SOS error is the result of the radiologist's attention being diverted from a tumor by an eye-catching but unrelated finding. Another issue that may affect observer performance is intentional under-reading, that is, a conscious tendency to interpret equivocal radiographic shadows as negative [22]. This may occur because of collegial pressure to reduce the number of false-positive interpretations, and thereby decrease unnecessary work-ups.

Failures of abnormality detection in film reading (i.e. perceptual errors) are subject to psychophysiological factors of human visual perception [23]. They are common to visual perceptual tasks in general and are relevant to other professions (e.g. air traffic controllers, professional drivers) in which active observation is a key part of professional activity. Perceptual errors, in general, are likewise related to multiple psychophysiological factors, including level of observer alertness, observer fatigue, duration of the observation task, any distracting factors, and conspicuity of the abnormality, among many others [24]. An additional source of perceptual error results from the influence a radiology report has over another radiologist: this error occurs because the radiologist reads the first report before looking at the films [25, 26].

1.3.2 Errors in Interpretation

An error of interpretation, as its name implies, occurs at the interpretation phase of film reading and usually comprises an incorrect diagnosis given to an abnormal finding (or, rarely, to a normal finding). There are many reasons why radiologists make errors in identifying and interpreting abnormalities.

Poor ergonomics and ambient light, frequent telephone disturbances, working with an inexperienced resident, clinical history and other factors are various sources of error.

Errors of interpretation in diagnostic radiology are analogous to errors of interpretation in other branches of medicine. The closest similarity is to physical diagnosis, in which signs may be misinterpreted, an organ position is unrecognized, heart sounds are mistaken for one another, and so on. The principles of whether an error of interpretation can be considered negligence are the same in diagnostic radiology as in other branches of medicine. It is very important that errors of interpretation are judged against the standard of an average competent medical practitioner rather than against the unachievable standard of perfection.