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Risk Management in Radiology Units: Managing an Acute Adverse Event in a Radiology Department

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Abstract

1. Introduction to Radiology Units and Risk Management

Radiology units in a hospital or clinic encompass a set of discrete functional areas where collectively large numbers of imaging procedures are performed. Diagnostic radiology alone typically accounts for more than 95% of all imaging studies, using a diverse menu of imaging techniques that include X-rays, ultrasound, computed tomography, magnetic resonance imaging, and positron emission tomography. Most of these radiology procedures are performed on an outpatient basis. The unique feature of the utilization pattern in a radiology unit is the concentration of a large number of imaging procedures in a relatively short period of time. This high-throughput characteristic is inherent to the design and function of a radiology unit. High-performance expectations, in fact, underlie the hierarchical organization and associated management structure of a typical radiology department.

Methods

Hospital radiology departments are at risk for a variety of acute adverse events. Events with high morbidity or mortality associated with a short time frame for onset after a triggering event require the development of a predetermined structured response or an emergency protocol. Events of this nature that can occur in a radiology department include: contrast media reaction, cardiopulmonary arrest, fire, and active shooter. This text reviews the components of developing an acute event response for these events and using a model of Six Sigma as a methodology can provide a method to standardize and evaluate the quality of the response.

Conclusion

In conclusion, radiology units face several unique risks, in addition to the more common risks that are associated with medical services in general. Radiology risks are dynamic, and interaction with the patients is usually brief. Management of contrast media is one of the major concerns of risk management in the radiology department. The rare occurrence of acute adverse events is no excuse to be unprepared, as the consequence of delayed treatment can be life-threatening. Protocols need to be in place with a clear division of responsibilities to ensure that an appropriately trained person responds to the event in a timely manner. Risk management in the radiology department extends beyond ensuring the safety of radiological procedures performed. It also includes all identified risks associated with equipment, environment, and staff. Regular audits and incident reporting should be encouraged to enable a proactive approach in preventing adverse events. Staff who are adequately trained and experienced are less likely

to make errors and should become the focus of risk management. In addition, the concept of patient safety extends to successive encounters in the department, and interpersonal risks, including risks of violence against staff, should be addressed.

Introduction

Acute adverse events represent an uncommon but highly unpredictable risk in radiology. This risk can have medical, psychophysical, and social implications. Clear and rapid communication, consequent professional collaboration, and immediate allocation of available resources are mandatory for event management. Frequently, only part of the involved radiological team is directly engaged in patient care when an adverse event occurs, but all unit staff members are generally affected to some extent because of bystander involvement. It is essential that all staff members are specifically trained not only in event prevention, but also in rapid event recognition and appropriate, unit-tailored therapeutic interventions. The corporate culture of the radiology department must involve risk management as a philosophy shared by all team members. Today, risk management should be seen as part of the daily routine of a radiology unit, since situations that compromise the quality of care provided to patients or that create risks for staff members can occur at any time. Routine should be seen as universally valid schemes and guidelines that have been validated and are applied generally. On the other hand, planning formulated by external consultants, who have no direct experience of internal operations or of the risks that may affect organizational processes, is unlikely to result in unit-specific, effective risk management. In this case, there is a risk that management may become just an empty slogan.

2. Types of Acute Adverse Events in Radiology Departments

Radiology units are characterized by high patient throughput and short periods of patient-staff interaction. The range of adverse events that can occur in radiology units is wide and includes events related to the procedure itself, such as contrast medium reactions or procedure failures, events associated with delays in diagnosis and treatment, such as lost or misidentified radiographs, and events that involve overcrowding and excessive waiting times. Many of the reported adverse events in radiology units relate to failures in communication or teamwork between the various professionals involved in the care of the patients and between staff and patients as well.

Adverse events related to radiological procedures can include inadequate performance of the examination, failure to diagnose, delay in diagnosis, or unnecessary diagnosis. These events can be caused, or at least partly contributed to, by the unique circumstances of the radiology unit, which include a high throughput of patients, relatively brief interactions between staff and patients, and often chaotic and overcrowded working environments. It is important that radiologists and other professionals working in radiology units are aware of the potential for adverse events and take appropriate measures to prevent them. In particular, the principles of risk management should be applied to the acute adverse events that occur in the radiology department.

3. Preventive Measures and Protocols in Radiology Units

Radiology departments or units have several patterns for work execution. One of the most notable is that patients or users do not have direct and prolonged contact with the professionals working in the unit; the only present "links" are the reception staff and the radiology professionals involved in the procedures – the technicians. The remaining specialties – predominantly diagnostic – have an on-call system that allows them to be available without physically being present in the department. This means that in a radiology department, the majority of the professionals – whether they are nurses, doctors, or auxiliaries – are from other units sharing their time between the two. The difficulty in managing risk is increased as informational processes gain tempo, transposing biological processes that are inherent to the results of tests such as those developed in a radiology unit.

The risk associated with diagnostic error in imaging examination has already been extensively explored. Aiming to minimize risks, a number of solutions have been developed: increasingly advanced technological standards that apply specific protocols for addressing each clinical question; double-checking; and the ongoing presence of a second professional who is immediately available. In relation to errors that occur during patient identification, which are associated with the loss or exchange of biological samples or the result associated with the wrong patient, there are also readily available solutions that rely on the use of labels with barcodes that are read in the patient's presence, and that activate and characterize the procedure, using software that is capable of supporting and consulting previous stages of work execution.

4. Response and Management of Acute Adverse Events in Radiology Departments

Radiology departments frequently manage acute adverse events. It is essential to be prepared and have clear protocols in place to ensure a timely and effective response. The spectrum of acute events that can occur in a radiology department is fortunately mostly of low acuity. These events can, however, serve as a canary in the coal mine for departments that are poorly prepared, signaling very chaotic, potentially unsafe conditions when staff are unable to respond in a coordinated fashion. We describe a hierarchy of management for acute adverse events in radiology, beginning with the immediate response of the staff on scene and progressing through involvement of unit, department, and hospital-level leadership. This chapter focuses on the response and management of acute adverse events and does so through the use of case examples.

The management of a radiology department has a responsibility for the operation, performance, and outcomes of a diagnostic and interventional service that is associated with some unique risks. Unlike many other clinical settings, radiology patients are often ambulatory and coming and going from the department. This presents a different set of risks from the inpatient setting of other hospital departments. In addition, many radiology procedures utilize ionizing radiation for diagnostic purposes. Exposure to radiation is associated with unique acute and long-term risks. The development of contrast agents has also added to the spectrum of possible adverse events due to the use of nephrotoxic or allergic contrast. In recent years, most of the focus on contrast-related adverse events has been on the management of contrast-induced nephropathy and on the occurrence of anaphylactoid reactions to non-ionic contrast media.

5. Case Studies and Lessons Learned

Risk management in radiology units is not only about preventing medical errors, but also managing clinical risks and adverse events that happen to patients. No matter how much effort we put into preventing such events, the possibility of human error ensures that they will continue to occur. Thus, being prepared to manage adverse events is just as important as trying to prevent them, and probably more important from the patient's perspective. We present two case studies that each describe a different acute adverse reaction to iodinated contrast media in patients undergoing contrast-enhanced CT examinations. From the radiology risk management perspective, we provide a review of the contrast reaction management policies and guidelines, and share our lessons learned from managing these cases. Risk management in radiology units is not only about preventing medical errors, but also managing clinical risks and adverse events that happen to patients. No matter how much effort we put into preventing such events, the possibility of human error ensures that they will continue to occur. Thus, being prepared to manage adverse events is just as important as trying to prevent them, and probably more important from the patient's perspective. We present two case studies that each describe a different acute adverse reaction to iodinated contrast media in patients undergoing contrast-enhanced CT examinations. From the radiology risk management perspective, we provide a review of the contrast reaction management policies and guidelines, and share our lessons learned from managing these cases. (Klüter et al.2021)(Lustberg et al.2023)(Hussain et al.2022)(Zamorano et al.2020)(Tansel, 2022)

6. Conclusion and Future Directions

In conclusion, radiology departments are service units with peculiar risks. The interaction between risks from the provider's angle, the receiver's angle, and within shared risks provides a unique outlook and a way to manage the risks in radiology. At present, much of the risk management structures and skills in radiology are developed from a limited range of models generally applied to improving quality and safety in healthcare services. They are the models devised for treatment and diagnosis. Equally important and potentially of considerable value would be models that can guide the development of services for patients with the aim of reducing the number of those who suffer adverse events as a result of commissioning errors. Such models would focus on the way that service delivery is performed, especially the way that patients are put at risk by the decisions that influence the way services are offered. In the future, more research needs to be conducted to support the practice. A more detailed and empirical study of the perception and support tools used by radiologists in the management of risks is necessary and required. Further research could also help in developing practical guidelines to help radiologists effectively manage risks in their work while increasing and strengthening efforts to improve risk management skills. As radiology is propelled increasingly into the private sector, into collaborations and shared facilities, it is important that we recognize these risks and continue to develop new strategies to ensure quality and safety in the provision of radiology services.

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