Practical Radiation Oncology (2018) **xx**, xxx–xxx

practical radiation oncology
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www.practicalradonc.org

Basic Original Report

Real-time management of incident learning reports in a radiation oncology department

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Abstract

Purpose: The optimal approach to managing incident learning system (ILS) reports remains unclear. Here, we describe our experience with prospective coding of events reported to the ILS with comparisons of risk scores on the basis of event type and process map location.

Methods and materials: Reported events were coded by type, origin, and method of discovery. Events were given a risk priority number (RPN) and near-miss risk index (NMRI) score. We compared workflow versus near-miss events with respect to origin and detection in the process map and by risk scores. A χ^2 test was used to compare the differences between workflow and near-miss events. A comparison of RPN scores was done by independent t test.

Results: During 2016, 1351 events were reported. Of these events, 1300 (96.2%) were workflow and 51 (3.8%) near-miss events. Workflow events were more likely to both originate (1041 of 1300 events; 81.2%) compared with near-miss events (31 of 51 events; 62.7%; $P = .005$) and be detected in pre-treatment (997 of 1300 events; 76.7%) compared with near-miss events (24 of 51 events; 47%; $P < .001$). Average occurrence (scale: 1-10) was 6.14 for workflow versus 3.33 for near-miss events ($P < .001$), average severity was 2.94 versus 7.35 ($P < .001$), and average detectability was 1.33 versus 4.67 ($P < .001$). Mean overall RPN was 22.4 for workflow versus 108.4 for near-miss events ($P = .07$) and mean NMRI was 1.16 versus 3.19, respectively. Events that originated and were detected in treatment delivery had the greatest mean overall RPN (38.2 and 32.1, respectively) and NMRI scores (1.62 and 1.6, respectively).

Conclusions: Our experience demonstrates that workflow event reports are far more common than near-misses and that near-miss events are more likely to both originate and be discovered in later treatment phases. The frequency of workflow reports highlights the imperative need for safety and operational teams to work collaboratively to maximize the benefit of ILS. We suggest a potential utility of the RPN system to guide mitigation strategies for future near-miss events.

Introduction

Incident learning systems (ILS) are a key element of a culture of safety in medicine[1] and provide an opportunity to understand and respond to events that may affect patient safety. There is wide variability in the type and utilization

Conflicts of interest: Dr. Jean Wright is an associate editor in the breast section of this journal.

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https://doi.org/10.1016/j.prro.2018.04.016
1879-8500/

of ILS across radiation oncology departments, from hospital-wide event and department-specific reporting systems to the Radiation Oncology Incident Learning System (RO-ILS). Radiation oncology departments have increasingly adopted the use of ILS into their safety and quality programs and the recently developed Accreditation Program for Excellence (APEx) standards by the American Society for Radiation Oncology identify a system to report and track events as a basic element of a quality radiation oncology department.[2] Despite this, the optimal approach to utilize and learn from ILS remains unclear.

Our radiation oncology department has a longstanding in-house ILS and a strong culture of reporting both near-miss and workflow events including minor documentation and process errors that may not directly impact treatment but can decrease efficiency and cause delays or other downstream effects. Our department developed the current version of its in-house ILS in 2011 and the system has been adapted and expanded since then to optimize its reach and utility in the department. In the first year of use, the system was utilized only in the central clinical location of the department and 193 events were reported. Since then, the department has grown to serve a large geographic region with 5 regional clinical sites and the ILS has been deployed over time in each location. The most recent site adopted the ILS in 2015.

In 2015, an interprofessional ILS task force convened to update and optimize the use of the system for use across all campuses including prospective event categorization and risk stratification. This approach is detailed in the methods section. The first full year of this real-time approach to event coding across all regional sites was fully operational in 2016 and 1351 events were reported. In addition to categorizing events by type, origin, and method of discovery, each reported event was given a risk priority number (RPN) on the basis of the failure modes effect and analysis (FMEA) model[3] and a score on the near-miss risk index (NMRI) as established by Ford et al.[4]

Herein, we describe our experience with this approach to prospective coding and scoring of events reported to the ILS during 1 calendar year including lessons learned and recommendations for department-specific utilization of ILS data going forward. Our long-term goal is to determine whether the FMEA model will be useful to identify mechanisms to reduce future risk by applying risk scores to events that have already occurred (rather than risk of future events, as in FMEA) and prioritize responses to events on the basis of these scores. We also aim to compare the utility and feasibility of the RPN to the NMRI.

Methods and materials

Event reporting

To promote event reporting, the ILS input page was simplified to include only the name of the reporter (optional because anonymous reporting is also possible), name of patient affected (if applicable), physical location where the event was discovered (drop-down menu that is specific to the clinical location within department), and brief description. The purpose of the entry is to provide factual information about the event but not analyze, identify cause, or otherwise interpret the event. After submission, the event is logged within the ILS and an automatic email with event details is sent to a specified response team on the basis of clinic location. The reporter also has the option to mark the event as urgent, in which case the on-call physicist is also paged to respond to the event immediately.

Event review and categorization

All events are reviewed on the day they are reported by the site's on-call physicist. The physicist completes a brief note section and fills in additional details as needed. The event is reported to the chief of clinical physics and a response occurs on that day if the event is marked urgent by the reporter, if the event resulted in any dose discrepancy in a patient's treatment, or if the on-call physicist deems further review for another reason necessary. Otherwise, the events are reviewed and coded by consensus by the ILS committee at the weekly review meeting.

A simplified process map was developed on the basis of our departmental workflow for external beam radiation therapy and broken into 7 process steps as well as an 8th category for equipment and software quality management (Fig. 1). A selection of common event titles was developed on the basis of our prior experience with the ILS and additional titles may also be entered as free text. A selection of common methods for event detection was also generated on the basis of our departmental workflow. Based on these categories, the ILS committee codes each event according to the following parameters (Table 1): Event type, event title, method by which the event was discovered, location in the process map where the event was discovered, and location in the process map where the event originated. Event types were categorized as documentation, process, near-miss, and reportable event. A near-miss was defined as any event that had the potential to reach the patient or reached the patient but was deemed not to have a meaningful clinical impact. The criteria for a reportable event follow local designations that are established by the state department of the environment.

Each event is assigned an RPN and disposition. The risk priority number is based on the FMEA model[3,5–7] and consists of an assigned value from 1 to 10 for event occurrence (frequency), severity, and detectability. Table 2 summarizes the RPN categorizations we use. Because scoring of the events (even using a standardized scale) has a subjective element,[8] scores are assigned by committee consensus. Occurrence is scored on the basis of the likelihood of a similar event occurring based on current department processes. Severity is scored on the basis of