A Simple Incident Learning System for Radiation Oncology in a Community Hospital

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INTRODUCTION

Traditionally, event reporting and analyses were based on dosimetric deviations [1]. Little consideration was given to workflow. Most recently, the landscape of patient safety and quality assurance is going through profound changes throughout the entire health care industry, including radiation therapy. These changes were started by a series of events and initiatives taken by the government and trade associations. In 2000, the Institute of Medicine published a report [2] showing that errors are more commonly caused by faulty systems, processes, and conditions that lead people to make mistakes or fail to prevent them. Focusing on the process and workflow rather than blaming an individual is a paradigm shift in root-cause analysis. This was recognized in the Patient Safety and Quality Act [3] passed by the United States Congress in 2005, and the groundwork was in place for the development of incident learning systems (ILS).

Improvements in patient safety at large centers have been reported by many [4-6]. In this work, we present our attempt at implementing an ILS suitable for and manageable by a community radiation therapy department.

ACTION

We have implemented a simple ILS on the basis of the following steps: catch an incident, near miss, or unsafe condition; write a report; analyze what process step needs to be changed; create checklists, encounters, and workflow modifications, establish safety barriers, and write meaningful policies and procedures; and monitor progress. Emphasis was placed on the paradigm shift in voluntary event reporting and the importance of creating and maintaining a nonpunitive and positive environment. At the heart of our ILS is the safety committee, with representations from physicians, physicists, dosimetrists, therapists, nurses, and office coordinators. Meetings are held roughly once a month.

Event Reporting

An in-house program based on Microsoft Excel in conjunction with Visual Basic (Microsoft, Redmond, Washington) was developed. A shortcut to the program was placed on every desktop computer in the department. The form is simple, with only four entries: (1) the name of the person reporting, (2) the process step the event is discovered (this is a drop-down list of possible steps in the workflow), (3) the patient's medical record number, and (4) a free-format text box for describing the event that expands as needed.

Once an event is submitted by clicking the "Submit" command button, the program assigns a chronological event number to the report, stamps the system date and time, and creates a PDF file written to a designated location. The success of the program depends on the simplicity and accessibility of reporting in addition to creating and maintaining a positive nonpunitive environment.

Reviewing and Categorizing Events

Initial review of events is done by physicists. Events are divided into three categories, incident, near miss, or unsafe condition, as defined by the Agency for Healthcare Research and Quality [7]. Incidents are any events, harmful or not, that have reached the patient. A near miss is a safety event that could cause harm if it reached the patient but was caught earlier in the workflow. Finally, unsafe conditions are circumstances that increase the probability of the occurrence of a patient safety event.

The reported events are analyzed to determine their categories, where each event originated, and how they affect subsequent process steps. Additional information about the events is

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gathered if necessary before the discussion with the larger safety committee.

Events are presented and discussed by the interdisciplinary safety committee on a monthly basis. Possible remedial action is developed by consensus. The actions could be introducing or modifying a checklist or modifying a step in the workflow, or other actions. The therapists also meet on a monthly basis in a separate meeting at which the events concerning the therapists are reviewed. Ideas are often generated to modify workflow or to introduce checklists or encounters to prevent future events from occurring.

Monitoring Progress

The most straightforward way to monitor the progress of the ILS is to track the number of events and their categories. The number of events by type and origin, as well as where and which staff group detected them, help with the workflow issues and how to prevent future events.

To our knowledge, only one other nonstandard metric has been suggested in the literature [8]. In this reference guide, it was proposed that the ratio of potential incidents plus minor incidents to the number of serious incidents plus major and critical incidents be followed over time. We have used two different ratio metrics more suitable for a single clinic with a smaller number of events. We define "adverse ratio 1" as the ratio of incidents plus near misses to the total number of events and "adverse ratio 2" as the ratio of the number of incidents to the total number of events.

OUTCOMES

Distribution of Event Reporting by Staff Group

A total of 299 events were reported in about 1 year after the start of the ILS. Most events were reported by the therapists, followed by physicists and dosimetrists. The numbers of events reported by these three groups were 178, 92, and 17, respectively. Other groups reported small numbers of events. Physicians reported 4 events.

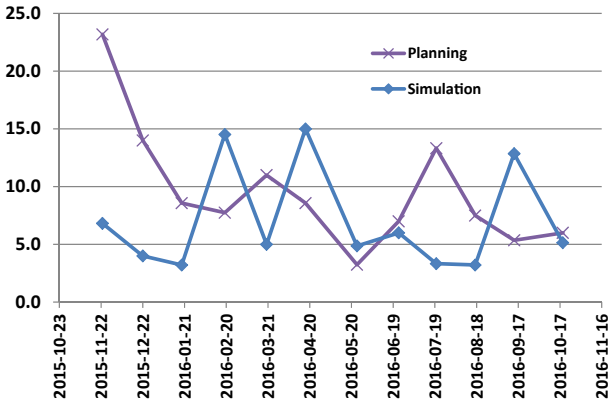

Fig 1. Number of events reported per 30-day period for two selected event origins.

Origins of Events and Actions Taken to Prevent Them

For rapid implementation, we focused on the origins of the events. The largest number of events was originated at the "planning" steps followed by "simulation" steps. Monthly numbers of events in these two categories are presented in Figure 1.

The maximum number of events originated in the "planning" step in the first month. Thus, we decided to implement a checklist for dosimetry. The checklist contains items such as correct patient orientation, set user origin correctly, appropriate calculation algorithm used, breakpoint added, and so on. The list is placed in our electronic health record (ARIA, Varian Medical Systems, Palo Alto, CA) as an "encounter." Each item has a box to check off before a plan proceeds to the next workflow step. As seen in Figure 1, a substantial

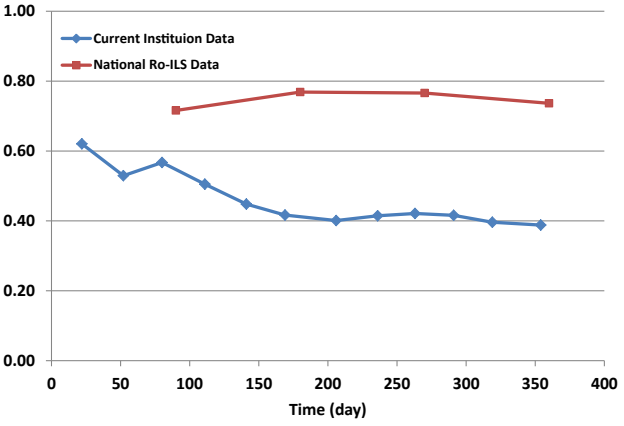

Fig 2. Adverse ratio 1 (ratio of cumulative number of incidents plus near misses to total number of events) reported as a function of time (diamonds). Connected squares are the same ratio compiled from the quarterly report of the national Radiation Oncology Incident Learning System program for the first four quarters.