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Research Article

Examining the Effectiveness of Action Plans Derived from the Root Cause Analysis of Incidents Occurring in a Radiation Therapy Department

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ABSTRACT

Purpose: In 2011, the Canadian Partnership for Quality Radiotherapy developed guidelines for quality improvement. In the same year, a large academic cancer centre initiated a program of root cause analysis (RCA) and incident learning for major incidents. RCAs were performed on seven incidents; more than 40 action items were developed with the intent to prevent these incidents from recurring. The aim of this study was to determine the efficacy of implementation of the six action items, evaluate radiation therapists' (RTTs') awareness of these new action items, and determine whether communication among staff members was satisfactory.

Methods and Materials: The study consisted of two components. Part one examined four action items using a questionnaire distributed to all RTTs at the cancer centre. Part two examined two action items by auditing the radiation treatment software, MOSAIQ.

Results: Staff communication and RTTs' awareness of the action items ranged from 71% to 98%. For the first four action items, although most RTTs were aware of them, only 40%–70% of RTTs always or often used these action items and considered them effective. The fifth action item, implementation of the new breast tolerance setting, had 51% more overrides after implementation. Further investigation indicated only 40% of the tangent breast setups had new tolerance settings applied.

Conclusions: Communication plays an important role in the dissemination and application of interventions identified from an RCA. A standardized route of communication is required to ensure that all RTTs fully understand an action item. A follow-up program and continuous monitoring of the action items are key to an effective RCA program.

RÉSUMÉ

Introduction/Objectif : En 2011, le Partenariat canadien pour la qualité en radiothérapie (PCQR) a rédigé des lignes directrices sur l'amélioration de la qualité. La même année, un important centre d'étude sur le cancer a lancé un programme d'analyse des causes fondamentales et de recherche sur les incidents majeurs. L'analyse des causes fondamentales a été effectuée sur sept incidents; plus de 40 mesures ont été mises au point pour prévenir ces incidents. L'étude visait à déterminer l'efficacité de la mise en place de six de ces mesures, d'évaluer la sensibilisation des thérapeutes en radiation à ces nouvelles mesures et à déterminer si la communication entre les membres du personnel était satisfaisante.

Méthodes et matériel : L'étude se composait de deux parties. La première examinait quatre mesures au moyen d'un questionnaire distribué aux thérapeutes en radiation du centre de cancer. La deuxième partie examinait deux mesures en vérifiant le logiciel de traitement de radiation, MOSAIQ.

Résultats : La communication au sein du personnel et la sensibilisation des thérapeutes sur les mesures de suivi s'échelonnaient de 71 à 98%. Pour les quatre premières mesures, bien qu'elles aient été connues des thérapeutes, seulement 40-70% d'entre eux les utilisaient toujours ou souvent et les jugeaient efficaces. La cinquième mesure, la mise en place du nouveau paramètre de tolérance du sein, était utilisée 51% plus souvent après la mise en place. Un examen plus avancé a révélé que les nouveaux paramètres de tolérance du sein avaient été appliqués dans seulement 40% des cas.

Conclusions : La communication joue un rôle important dans la diffusion et l'application des interventions provenant d'une analyse des causes fondamentales. Un canal de communication standardisé s'impose pour s'assurer que tous les thérapeutes en radiation comprennent bien les mesures mises en place. Un programme de suivi et une surveillance continue des mesures mises en place sont la clé d'un programme efficace d'analyse des causes.

Keywords: Root cause analysis; action items; effectiveness; awareness; radiation therapist

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Introduction

In recent years, radiation therapy has become a predominant treatment for cancer, which is the leading cause of death worldwide [1]. In 2005, approximately 50% of cancer patients required at least one radiation treatment [2]. A total of 3,125 radiotherapy-related incidents were published and reported worldwide between 1976 and 2007 [3]. As the field of radiation oncology evolves and the technology and techniques grow in complexity, the associated risk of errors increases. Due to the high risk of errors, international safety guidelines and quality assurance (QA) protocols have been developed and are updated regularly to prevent errors from occurring. For example, a radiation therapy–specific incident learning system has been introduced by the Health Technology Assessment Unit at the Alberta Heritage Foundation for Medical Research in Canada [4]. Incident rates have decreased worldwide due to the implementation of QA policies, safety guidelines, and upgraded hardware and software [5]

In 2011, the Canadian Partnership for Quality Radiotherapy developed guidelines for quality improvement stating that necessary steps are to be taken to prevent incidents from recurring through the development of a QA program [6]. Root cause analysis (RCA) has been identified as an effective incident learning tool, first used by engineers in the aviation and aerospace industries [7]. "Over the years, healthcare organizations began to adapt the RCA methodology to healthcare settings as there appeared to be a similar reliance on complex interactions and communication" [7]. RCA highlights what, how, and why the incident happens. Incident learning is a compelling agent of practice change. However, to properly assess this, the program must be coupled with a feedback of the effectiveness of the action items. According to Canadian Incident Analysis framework, a thorough and complete incident learning system not only requires an RCA to be performed; formalized recommended actions plans should also be developed, documented, implemented, and followed through to reduce the risk of recurrence [7].

Based on the Canadian Partnership for Quality Radiotherapy's 2011 recommendation, that year, a large academic cancer centre and teaching hospital initiated a program of RCA and incident learning. Using Cancer Care Ontario's incident classification system from 2012, there have been seven incidents classified as major or higher in the past 2 years. RCAs were performed for these incidents, and more than 40 action items were developed with the intent to prevent these incidents from recurring. To date, the action items developed from these RCAs do not have a follow-up program to evaluate their effectiveness. Although the centre has a transparent and well-documented incident reporting program, there is no formal evaluation for every action item to date. The goal of this study was to determine the efficacy of implementation of six of the action items, evaluate radiation therapists' (RTTs') awareness of these new action items, and determine whether communication among staff members was satisfactory. The six action items are listed in Table 1. Action items 1, 4, and 5 were split into section a and b because these action items were broad enough to be separated into smaller sections.

In 2011, Ford et al [8] focused on the potential of 15 quality control (QC) measures in detecting and preventing specific errors. These 15 QC checks included physician plan reviews, physics plan reviews, RTT chart reviews, and pretreatment intensity modulated radiation therapy QAs. The physics pretreatment plan review had the greatest impact (62%), and the effectiveness of the QC check increased rapidly and plateaued after six checks [8]; 97% of the errors were found after only seven checks [8]. These results further support the idea that repeated QC checks are key to the prevention of errors. The implementation of QC checks in this study could be categorized as implementation of an action item. By repeatedly performing QC checks, errors were found. This action item was effective since it discovered errors after repeated QC checks. The research study by Ford et al is similar to this study with follow-up of the action item. Ford et al then proved that their action item, QC checks, was effective. Chan et al (2010) [9] focused on the utilization and effectiveness of the new MOSAIQ interface in reducing errors. MOSAIQ is a patient information management software that regulates radiation therapy treatments. The study showed that errors that involved overlooking important documentation decreased from 73% to 33% with the new layout, and errors which overlooked changes in approval dates decreased from 56% to 0% [9]. The significant reduction in human error reinforced the effectiveness of the new MOSAIQ interface. The present study evaluated the MOSAIQ interface by focusing on human documentation habits. This study is also an example of an action item that intended to reduce errors and subsequently prevent incidents from occurring. This follow-up research proved that the new action item, MOSAIQ interface, was effective. According to Hendee and Herman (2011) [10], there are six types of effective hazard mitigation: forcing functions and constraints, automation and computerization, simplification and standardization, reminders and checklists, policies and procedures, and training and education. Hendee and Herman [10] indicated that automated forcing functions and constraints are the most effective factors in reducing errors, whereas training and education are the least effective. In this study, three of the hazard mitigation types were examined: forcing functions, policies and procedures, and education. The effectiveness of each category was determined, and the result checked to ensure consistency with article by Hendee and Herman.

There is limited literature regarding the action items derived from the RCA of incidents. Pham et al [11] discussed the use of the Commercial Aviation Safety Team framework, an improved model for performing RCA. In this model, a Likert scale was used to rate the importance and effectiveness of the interventions identified after adverse event and detailed plans were developed to implement the recommendations [11]. Pham et al also supported the idea of a follow-up program by utilizing a survey as a means to evaluate the staff's awareness of interventions and comments in the effectiveness of the recommendations [11].