



## Does lean management improve patient safety culture? An extensive evaluation of safety culture in a radiotherapy institute



Pascale A.M. Simons<sup>a,\*</sup>, Ruud Houben<sup>b,c</sup>, Annemie Vlayen<sup>d</sup>, Johan Hellings<sup>d</sup>,  
Madelon Pijls-Johannesma<sup>b,c</sup>, Wim Marneffe<sup>a</sup>, Dominique Vandijck<sup>a,e</sup>

<sup>a</sup> Hasselt University, Faculty of Business Economics, Martelarenlaan 42, BE3500 Hasselt, Belgium

<sup>b</sup> MAASTRO Clinic, Maastricht, The Netherlands

<sup>c</sup> Dept. of Radiation Oncology (MAASTRO), GROW – School for Oncology, Maastricht University Medical Centre, The Netherlands

<sup>d</sup> Hasselt University, Faculty of Medicine, Hasselt, Belgium

<sup>e</sup> Ghent University, Faculty of Medicine and Health Sciences, Ghent, Belgium

### A B S T R A C T

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**Purpose:** The importance of a safety culture to maximize safety is no longer questioned. However, achieving sustainable culture improvements are less evident. Evidence is growing for a multifaceted approach, where multiple safety interventions are combined. Lean management is such an integral approach to improve safety, quality and efficiency and therefore, could be expected to improve the safety culture. This paper presents the effects of lean management activities on the patient safety culture in a radiotherapy institute.

**Methods:** Patient safety culture was evaluated over a three year period using triangulation of methodologies. Two surveys were distributed three times, workshops were performed twice, data from an incident reporting system (IRS) was monitored and results were explored using structured interviews with professionals. Averages, chi-square, logistical and multi-level regression were used for analysis.

**Results:** The workshops showed no changes in safety culture, whereas the surveys showed improvements on six out of twelve dimensions of safety climate. The intention to report incidents not reaching patient-level decreased in accordance with the decreasing number of reports in the IRS. However, the intention to take action in order to prevent future incidents improved (factorial survey presented  $\beta$ : 1.19 with  $p$ : 0.01).

**Conclusions:** Due to increased problem solving and improvements in equipment, the number of incidents decreased. Although the intention to report incidents not reaching patient-level decreased, employees experienced sustained safety awareness and an increased intention to structurally improve. The patient safety culture improved due to the lean activities combined with an organizational restructure, and actual patient safety outcomes might have improved as well.

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### Introduction

Safety has a long history in radiotherapy and oncology (Clark et al., 2010; Pawlicki et al., 2011; Shafiq et al., 2009). To maximize the safety of treatment, sustainable improvements in patient safety should be created. The importance of a patient safety culture for

improving safety, is no longer questioned (Nieva and Sorra, 2003). A patient safety culture is referred to as the employees' shared beliefs, values and attitudes regarding patient safety in an organization, which are reflected in the daily operational clinical practice (Nieva and Sorra, 2003; E.H. Schein, 1992).

Although patient safety culture is an important concept for realizing safe care, the strategy how to create a safety culture and how to evaluate improvements is less evident. Safety culture is, as well as patient safety outcomes, difficult to measure objectively (Dixon-Woods et al., 2012; Morello et al., 2013; Vincent et al., 2013). To evaluate safety culture, surveys are widely implemented. However, these surveys evaluate safety climate and provide a snapshot of the perceptions of professionals on the

\* Corresponding author. Tel.: +32 11 268705.

E-mail addresses: [pascale.simons@uhasselt.be](mailto:pascale.simons@uhasselt.be) (P.A.M. Simons), [ruud.houben@maastro.nl](mailto:ruud.houben@maastro.nl) (R. Houben), [annemie.vlayen@uhasselt.be](mailto:annemie.vlayen@uhasselt.be) (A. Vlayen), [johan.hellings@uhasselt.be](mailto:johan.hellings@uhasselt.be) (J. Hellings), [madelon.pijls@maastro.nl](mailto:madelon.pijls@maastro.nl) (M. Pijls-Johannesma), [wim.marneffe@uhasselt.be](mailto:wim.marneffe@uhasselt.be) (W. Marneffe), [dominique.vandijck@uhasselt.be](mailto:dominique.vandijck@uhasselt.be) (D. Vandijck).

observable, surface-level aspects of the culture on a specific moment in time (Zohar, 2010). The most frequently applied surveys are the Safety Attitudes Questionnaire (SAQ) (Sexton et al., 2006) and the Hospital Survey on Patient Safety Culture (HSOPSC) (Blegen et al., 2009), both presenting good psychometric properties (Blegen et al., 2009; Etchegaray and Thomas, 2012; Nieva and Sorra, 2003; Sexton et al., 2006). However, following the reciprocal safety culture model of Cooper and Philips which is based on the social learning theory (Cooper Ph. D, 2000), safety climate is just one of the elements affecting safety culture. In addition to safety climate, safety behaviour and situational factors like the safety management system interact bi-directionally. To meet the complex nature of this concept, triangulation of methodologies should be used for its' evaluation (Cooper Ph. D, 2000; Morello et al., 2013). If we want to evaluate whether we, as professionals, progress on safety awareness and behaviour, we should also measure exactly these. According to Schein's model of organizational culture, behaviour (first level) could be more easily changed and measured than the values/climate (second level) regarding safety (Edgar H. Schein, 1984).

Besides the rigorous measurement problems, changing patient safety culture is challenging. No uniform strategy to improve safety culture is available and sustainability of effects are unclear. Generalizability of evidence of the different strategies is limited, since effects are highly dependent on intrinsic organizational elements such as the level of executive support, the extent of implementation, the size of the organization and the personnel facilitating for change. However, evidence is growing for a multifaceted approach, where multiple safety interventions are carefully selected and combined to strengthen each other, instead of initiating isolated safety projects (Morello et al., 2013).

Lean management is a quality improvement philosophy, which uses a set of instruments and incorporates a long term vision aiming for continuous improvement (Liker, 2004). This philosophy focuses on the improvement of the care processes and eliminating non-value added (waste) steps from the patients' perspective. By putting the patient central, striving for continuous optimization of processes and engaging all employees for improvement, this philosophy aims to maximize quality and safety for the patient combined with efficiency and motivated employees. Several instruments can be used to help improve the processes; e.g. value stream mapping, which visualizes the entire patient process with all its' bottlenecks, and Kaizen (Japanese for improvement), meaning daily small changes for the better involving all employees to create continuous improvement. Improved patient safety culture

is one of the expected benefits of lean, because lean aims to commit employees to quality and safety improvement.

We hypothesized that the patient safety culture and the intentions for safety behaviour would benefit from the undertaken lean actions. This study aimed to evaluate the patient safety culture and safety behaviour of healthcare professionals within a radiotherapy institute after undertaking lean actions for a three year period.

## Methods

### Study design

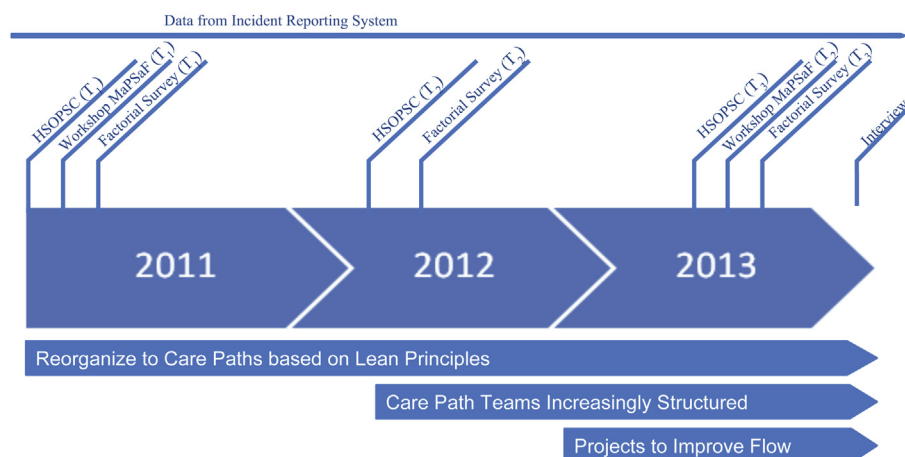
To evaluate changes in patient safety culture and behaviour data was collected longitudinally for three years. Because of the challenging aspects of patient safety culture evaluation, a triangulation of methodologies was used for data collection. In the mixed methods study, quantitative results were collected for three time periods, once before and twice throughout the implementation of the lean based actions (Fig. 1) and were combined with qualitative data. Quantitative results incorporated data from:

1. Workshops of safety climate.
2. Surveys.
  - 2a . Surveys on safety climate.
  - 2b . Surveys on patient safety awareness and behaviour.
3. Reports from an incident reporting system, reporting behaviour.

The workshops and surveys evaluated the patient safety climate, as well as intentions for safety behaviour, each from a different perspective. The reports from the incident reporting system were gathered to complement the results on safety culture and behaviour, since willingness to report is one of the issues reported by the surveys. Since the evaluation of safety culture strategies would benefit from combining quantitative and qualitative methodologies (Morello et al., 2013), structured interviews were performed to increase understanding in the quantitative results.

### Setting

This study was performed at a radiotherapy institute in the Netherlands, where yearly 3000–4000 oncology patients receive radiotherapy treatment. The radiotherapy process is characterized by a complex multidisciplinary treatment facility using highly



**Fig. 1.** Timeline of the study. The items beneath the timeline represent the implemented actions and the items above the timeline the different methodologies and measurements for evaluation. HSOPSC: Hospital Survey on Patient Safety Culture. MaPSaF: Manchester Patient Safety Framework.

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