Identifying Factors for Successful Implementation of Simulation Modeling in Healthcare

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ABSTRACT

A number of academic literature surveys have shown that only a small fraction of published healthcare simulation studies are actually implemented. This research identifies factors that can contribute to successful implementation of simulation results in healthcare. The authors have been involved in a six year long simulation study in a Swedish regional hospital’s operating department. The three most important factors that contributed to implementation in this case were: the timing of simulation study to support a critical decision, advantageous cost benefit ratio of the implementation and thorough model validation. Other contributing factors included high degree of staff involvement, availability of good quality data, as well as proper incentives to improve the system. Findings of this study can help in establishing the prerequisites for successful implementation in other cases.

Keywords: Healthcare Simulation, Implementation, Operating Room Planning, Simulation Quality, Success Factors

INTRODUCTION

One of the challenges that healthcare systems face today in many developed countries is insufficient capacity. Issues such as increased demand, rising costs, limited capacity, limits in technology and informatics as well as lack in industrial engineering tools and methods are key drivers to hospital capacity problems (Williams, 2006). Capacity problems create delays in healthcare delivery, and according to Hall et al. (2006), successful work in reducing delays depends on collaboration between administrative and clinical processes, ability to see healthcare as a system and find bottlenecks and system failures in patient flows.

DOI: 10.4018/IJPHIM.2015010101
Simulation modeling, along with other operations research methods have been applied in healthcare management since the 1950s (Royston, 2009) and can help dealing with complex and dynamic nature of healthcare capacity management (Green, 2004). During the last few decades there has been a growth of interest in this area resulting in a significant increase of published studies (Fone et al., 2003; Brailsford et al., 2009). Despite the vast amount of literature describing applications of simulation in different healthcare settings there is little evidence on how the results of simulations are actually implemented (Fone et al., 2003) and what exactly the contribution of simulation to healthcare improvement is. Several authors (Brailsford, 2005; Eldabi, 2009; Harper & Pitt, 2004; Roberts, 2011) have proposed possible causes for this lack of reported implementations. One of the most recent studies on simulation implementation issues by van Lent, VanBerkel & van Harten (2012) concludes that more research into the perceived success factors is necessary.

The aim of this paper is therefore to identify factors that contribute to successful implementation of simulation results in healthcare. The research method used for data collection and analysis, apart from simulation modeling itself, has been a longitudinal case study research. The method was chosen primarily because of the unique opportunity to follow a successful simulation project for a prolonged period of time and also because this method allows to study the implementation phenomenon within its organizational context. This approach also allows researchers to gain additional, deeper insight into a problem situation when compared to survey research. Data was collected through interviews and on-site observations and then analyzed using a framework of implementation facilitators and obstacles identified in the earlier research on simulation implementation.

Specifically, the paper describes a case study in operating room planning at a Swedish regional hospital where simulation has been used in a project consisting of several different sub-projects over a time period of more than six years. The description is focused on the aspects related to implementation and does not include a complete account of model details and results in each stage. The simulation model of the operating department, its development, validation and experiments are described in more detail in a paper by Steins, Persson & Holmer (2010).

Given a set of potential obstacles for implementation which have been summarized and reported elsewhere on the one hand and the successful simulation project on other hand, it is possible to identify which strategies have been used to neutralize the obstacles. Looking for the obstacles and finding strategies to neutralize them, used with awareness or without, provides a list of examples of what can be done to ensure a successful implementation of simulation results in healthcare.

IMPLEMENTATION OF HEALTHCARE SIMULATION

Academic Literature Surveys

Over the years many literature surveys on simulation modeling in healthcare have been published resulting in a comprehensive overview of past simulation projects. These surveys cover many aspects of healthcare simulation, including the implementation problem (e.g. Wilson, 1981; Jun, Jacobson & Swisher, 1999; Fone et al., 2003; Brailsford et al., 2009; Gunal & Pidd, 2010; Katsaliaki & Mustafee, 2011; van Lent, VanBerkel & van Harten, 2012).

In a survey published in the early 1980s (Wilson, 1981) only 16 out of 200 simulation projects were found to be successful in terms of implementation of simulation results. Jun et al. (1999) carried out a survey focusing on discrete-event simulation applied to healthcare clinics with many examples of simulation models used for patient scheduling and routing as well as resource
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