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Developing and validating a scientific model for exploring safe work practices in interdisciplinary teams

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ABSTRACT

Health research literature on quality and safety in recent years has pointed to a need to explore the characteristics of interdisciplinary team work unique to the health care sector and the particular organization. The literature also has identified a need for scientific models that explore and integrate existing findings concerning team dynamics. In this article, I attempt to address these concerns by developing and validating a scientific model for exploring safe work practices of interdisciplinary OR teams. Specifically, existing health research literature on quality and safety is reviewed to identify and incorporate various team-related aspects into dimensions of the proposed model. To further validate the model, I conduct an ethnographic study of safe work practices within an interdisciplinary OR setting. I find that safe work practices can be viewed as a product of the individual's and team's ability to draw on and combine explicit and tacit knowledge repertoires, which again is a product of the particular inner and outer structural conditions of a system. While the findings add their own unique distinctiveness to the scientific model, the findings also compare to the existing aspects and dimensions of the model. I conclude that the fit of the empirical data to the model improves the validity of the model, and also the potential application of the model in ethnographic research within different medical and/or team settings.

1. Introduction

Safety principles used in high reliability sectors, such as civil aviation, have received increased recognition in health research literature on quality and safety over the recent years (Burke et al., 2004; Gaba, 2000; Morey et al., 2002; Riley, 2009; Salas et al., 2009; Wilson et al., 2005), and it is now commonly believed that training in team skills, within a simulated or clinical environment, can lead to improvement of these skills, safer practices, and overall higher levels of occupational safety and patient safety. However, the claim regarding safety improvement remains to be documented. Specifically, health research literature on quality and safety points to weaknesses in the identification and understanding of, and training for, health care specific team skills (Baker et al., 2006; Lyndon, 2006; Reader et al., 2006); in the commitment of resources and time necessary to ensure team training (Burke et al., 2004; Harris et al., 2006); and in the focus on research and development of scientifically grounded models that can integrate existing findings (Manser, 2009) and that can be applied to explore and measure the dynamics and performance of interdisciplinary teams (Baker et al., 2006; Healey et al., 2004, 2006b). The above concerns are summarized by Flin and Mitchell (2009): "Given the importance of anaesthetic, theatre nursing and surgical tasks for patient safety during an operation, it is surprising how little scientific investigation of working life has taken place in this domain. There are very few reports of the culture and behaviour patterns in surgical and anaesthesia units ..." (p. 1). Thus, the nature of interdisciplinary teamwork in health care has yet to be properly explored, particularly in terms of integration into existing training programs and designs.

In this article, I attempt to answer the above calls to explore team work characteristics and to integrate existing findings (Manser, 2009) into a scientifically grounded model (Baker et al., 2006; Healey et al., 2004, 2006b). Specifically, my first approach in answering the two calls is to review empirically-based team-related health research to incorporate the findings as aspects and dimensions of a scientific model for exploring safe work practices of interdisciplinary teams. My second approach is to validate the proposed model, specifically by means of an ethnographic study I conducted within an interdisciplinary OR setting (Høyland et al., 2011a,b). Combined, the two approaches provide the model's scientific foundation as well as anchor to both existing findings (literature review) and new findings (ethnographic study).

2. Developing a scientific model – review methodology

In order to develop the scientific model I conduct a three-phased literature review process. Specifically, I combine online

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searches and searches within a local EndNote database, to identify and later determine the specific team-related aspects and dimensions of the model. In response to Manser's (2009) identification of the need for a scientifically grounded model that can integrate existing findings, I have specifically identified empirically-based/original articles and findings.

2.1. Review Phase 1

The first review priority was to identify team-related aspects commonly addressed in original health research literature on quality and safety. Given this aim, I searched the electronic online databases PubMed, Web of Science, and Academic Search Elite on abstract, title, topic, and/or key words containing "team" and "health care" and "result" or "finding." The emphasis on abstract, title, topic and/or key words and "result" or "finding" (in separate searches) helped to narrow the searches significantly by filtering out articles that did not include original findings. The actual hits in the online databases varied between approximately 100 and 400 articles. Among these hits, many articles did not focus on the team primarily but rather on topics of mental illness, elderly care, delivery of care, management of risks, patient experiences with illnesses and care, and so forth. Of the hits that did focus on the team primarily, for example in relation to a particular profession or in relation to primary care or surgery, I identified the following recurrent aspects (closely related aspects are grouped): (1) communication, (2) training or performance, (3) experience or learning, (4) management or organization, and (5) complex or context.[1]

2.2. Review Phase 2

After the preliminary identification of team-related aspects, I systemized the identified aspects according to specific dimensions that could fit a scientifically grounded model for exploring safe work practices. *System* became a "natural" category for including aspects such as management or organization and complex or context. As for support within health research literature on quality and safety specifically, Catchpole et al. (2006) explore the systemic aspects affecting paediatric cardiac surgery, described as patient threats (related to anatomy and physiology) and environmental threats (related to equipment, workspace and external resources). Another account within health research literature on quality and safety supportive of the system dimension is seen in Infante (2006), who argues that a systems model needs to be developed that makes the broader system dimension explicit, including the environment, organizational factors, structural factors, system design, adaptation, and policy (p. 520). There is also general support for viewing health care as a system of a complex and adaptive nature, in which people can act in unpredictable ways and actions between patient, clinicians, and technology are interconnected in so-called clinical microsystems (Barach and Johnson, 2006; Donaldson and Mohr, 2000; Mohr, 2000; Mohr et al., 2004; Mohr et al., 2003; Quinn, 1992).

The common factor in systemizing the remaining aspects – communication, training or performance, and experience or learning – is their basic anchor to *knowledge*. A clarification of the concept is thus needed. From an evidence-based medicine (EBM) perspective, knowledge rests on the model of technical rationality, where an individual practices problem solving according to established scientific theories and techniques (Schon, 1991, p. 21). The technical rationality model represents the "proven and explicit knowledge repertoire" that OR personnel rely on, comprised of procedures, protocols, routines, etc. However, critiques of the technical rationality view argue that one must account for the kinds of knowledge health care personnel actually use in practice, where not only the explicit but also tacit elements of knowledge such as clinical judgment and expertise come into play (Braude, 2009; Haynes, 2002; Henry, 2006; Polyani, 1966). With this understanding, the connection between knowledge and the remaining identified aspects can be made. Specifically, the communication aspect has explicit knowledge elements expressed as protocols or routines that over time have proven to be "the right way of doing things". Checklists, for example, are typically used as cognitive aids during task completion (Hales et al., 2008), and has proved important to information exchange and team cohesion in the operating room (Lee, 2010; Lingard et al., 2005). Other ways of communicating occur through the use of body language and listening (Friedman and Bernell, 2006), and also through the selective use and control of information flow (Riley and Manias, 2009). The last examples illustrate the less visible sides of communication; the tacit knowledge elements. Similarly, performance will be shaped by the explicit knowledge elements developed through training, such as the focus on economy of hand motion to measure technical competence (Grober et al., 2010) or the focus on formal instruction for more advanced technical skills (Benson et al., 2010). However, performance will also be formed by skilled judgment based on personal experience (Thornton, 2006), enhancing the ability to handle patient and recognize the limit of safe practice (Smith et al., 2006), i.e. tacit knowledge elements. In sum, the described links between different types of knowledge and the remaining aspects identified from the literature review, suggests that knowledge represents a potential second dimension of the scientific model.

2.3. Review Phase 3

To determine additional support for and validity of the two identified dimensions of system and knowledge, I utilized a local EndNote database on health research literature. The database contains about 500 scientific references to publications in the area of health research on quality and safety. These publications mainly feature articles addressing a wide range of health care safety topics from training and simulation to culture and risk governance published in the period between 1990 and 2010. The database references originate from searches conducted mainly via electronic online databases such as ArticleFirst, Medline/PubMed, Web of Science, ISI Web of Knowledge, and Academic Search Elite.[2] To obtain an overview of relevant publications in this database, I explored combinations of key words and search phrases from review phase 1 in relation to the identified dimensions and aspects:

- The knowledge dimension was searched according to "team" and "finding" or "result" in combination with "communication" (55 hits), "training" or "performance" (73 hits), "experience" or "learning" (50 hits).
- The system dimension was searched according to "team" and "finding" or "result" in combinations with "management" or "organization" (94 hits), "context" or "complex" (45 hits).

Judging from the number of hits on articles that addressed the system and knowledge dimensions, both dimensions have support in health research literature on quality and safety. To represent this finding, I included a number of articles representative of the identified aspects and dimensions in the article. The included articles had to demonstrate both original findings and a high relevance to the identified team-related aspects and dimensions (selection criteria).

[1] "Complex" rather than "complexity" was chosen to include a broader number of articles.

[2] Since 2005, the aim of the database has been to assist our research group in different health research projects on quality and safety.