

CONCEPT ANALYSIS

The concept of shared mental models in healthcare collaboration

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Accepted for publication 12 October 2013

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MCCOMB S. & SIMPSON V. (2014) The concept of shared mental models in healthcare collaboration. *Journal of Advanced Nursing* 70(7), 1479–1488.
doi: 10.1111/jan.12307

Abstract

Aim. To report an analysis of the concept of shared mental models in health care.

Background. Shared mental models have been described as facilitators of effective teamwork. The complexity and criticality of the current healthcare system requires shared mental models to enhance safe and effective patient/client care. Yet, the current concept definition in the healthcare literature is vague and, therefore, difficult to apply consistently in research and practice.

Design. Concept analysis.

Data sources. Literature for this concept analysis was retrieved from several databases, including CINAHL, PubMed and MEDLINE (EBSCO Interface), for the years 1997–2013.

Methods. Walker and Avant's approach to concept analysis was employed and, following Paley's guidance, embedded in extant theory from the team literature.

Results. Although teamwork and collaboration are discussed frequently in healthcare literature, the concept of shared mental models in that context is not as commonly found but is increasing in appearance. Our concept analysis defines shared mental models as individually held knowledge structures that help team members function collaboratively in their environments and are comprised of the attributes of content, similarity, accuracy and dynamics.

Conclusion. This theoretically grounded concept analysis provides a foundation for a middle-range descriptive theory of shared mental models in nursing and health care. Further research concerning the impact of shared mental models in the healthcare setting can result in development and refinement of shared mental models to support effective teamwork and collaboration.

Keywords: collaboration, concept analysis, health care, nursing, shared mental models, teamwork

Introduction

The need for nurses to work effectively with other healthcare professionals is vital in today's rapidly changing,

complex healthcare environment around the world. This need is underscored by the strong national agenda supporting interprofessional collaboration (American Association of Colleges of Nursing 2008, Institute of Medicine 2010).

Why is this research or review needed?

- Shared mental models facilitate effective teamwork and collaboration and have the potential to improve the overall patient experience.
- The definition of shared mental models in the healthcare literature is vague, making it difficult to apply consistently in research and practice.

What are the key findings?

- Shared mental models are a multidimensional concept that is context dependent.
- Awareness of the multiple dimensions will aid in the application of the concept to research and practice in healthcare settings, in general and nursing, in particular.

How should the findings be used to influence policy/practice/research/education?

- Interprofessional team members can enhance care provision by developing shared mental models.
- Understanding the complex nature of the concept will inform training and research efforts, thereby increasing the validity of these activities.

Thus, significant research focus has been given to understanding how teamwork can enhance the provision of care (e.g. Alonso *et al.* 2006, Baker *et al.* 2006). Throughout these investigations, shared mental models have been identified as a critical component that may facilitate effective teamwork. For instance, studies have shown that the ability to collaborate and work effectively as a team is enhanced by the presence of shared mental models (e.g. Westli *et al.* 2010). Specifically, team members must be able to communicate with and understand the perspective of those with whom they are working, in other words, develop shared mental models (Millward & Jeffries 2001). The resulting shared mental models have the potential to facilitate an adaptable, responsive and consistent work environment.

Our purpose herein is to present a concept analysis highlighting the multidimensionality of the shared mental model concept, particularly with respect to nursing and interprofessional collaboration in health care. We employ the Walker and Avant (2011) approach, while adhering to Paley's (1996) critique of this approach by embedding our analysis in the growing theoretical foundation for the shared mental models concept in the team literature outside the healthcare realm. This combined approach facilitates the application of a structured methodology that, when followed, results in a thorough analysis of the concept of interest, embedded in theory.

Background

The majority of studies concerning shared mental models in health care derive from discussions of crew resource management in the aviation industry (e.g. Leming-Lee *et al.* 2005, Carbo *et al.* 2011) and TEAMSteps (Team Strategies and Tools to Enhance Performance and Patient Safety, e.g. Alonso *et al.* 2006). Studies reviewed predominantly described implementation and evaluation of training programmes using shared mental models as a key construct of teamwork or decision-making (e.g. Leming-Lee *et al.* 2005, Carbo *et al.* 2011). Several studies performed qualitative assessments of shared mental models through focus groups (e.g. Kalisch 2009), interviews (e.g. Hysong *et al.* 2005, Custer *et al.* 2012) and observation (e.g. Westli *et al.* 2010). Findings suggest support for the importance of shared mental models and indicate that communication problems are more prevalent in teams without shared mental models (Westli *et al.* 2010). Conversely, expert-led teams are more likely to experience shared mental model development based on effective communication and data processing (Custer *et al.* 2012).

While nurses appeared in several of the studies identified, we found only one primarily focused on nursing. This study compared the shared mental models of nurses and nursing assistants who reported different perceptions of work being completed in relation to patient care (Kalisch 2009). Even though both groups must coordinate care to ensure safe, high-quality patient care, the lack of shared mental models found suggests that nurses and nursing assistants need to actively work together towards the development of shared mental models to enhance their communication and teamwork. As McComb *et al.* (2012) suggest, training may be beneficial in these types of situations where team members must coordinate care, but do not necessarily work together at the same time and/or in the same location.

Two overarching issues are apparent in the studies examining shared mental models in health care. First, the concept is most often depicted as a unidimensional construct. One notable exception is the qualitative study by Hysong *et al.* (2005). They identified three themes of mental models characterizing what clinical practice guidelines meant to the study participants (i.e. quality of care, administrative/pragmatic and resistance) and found that the employees from higher performing facilities possess shared mental models about clinical practice guidelines. Second, the definition of shared mental models in these studies is articulated at a very high level making it difficult to apply consistently across research studies. This inconsistency limits our ability

to draw conclusions from the body of evidence about the role shared mental models have in facilitating effective teamwork in healthcare settings.

Although the relevance of shared mental models as a critical component of teamwork can be seen in research findings, articulation of this concept is needed. In the team literature, the concept has evolved into a more clearly defined, multidimensional construct that is continuing to be refined through a growing body of research. Our concept analysis of shared mental models in health care, therefore, is embedded in this theoretical foundation.

Data sources

The literature search was conducted in PubMed, MEDLINE (EBSCO Interface) and CINAHL, with an additional search on Google Scholar. The search was not limited to shared mental models in the nursing realm only, shared mental models in conjunction with health care was searched for as well. In addition, the terms 'collaboration,' 'teamwork,' and 'mental model' were searched independently and in combination with 'nursing' and 'healthcare.' Included articles were published in English between 1997–2013.

Results

Uses of the concept and related concepts

Shared mental models first gained prominence in health care in the mid-2000's when the teamwork training programme TeamSTEPPS was introduced (Alonso *et al.* 2006). The development of this programme was a collaboration between the Agency for Healthcare Research and Quality and the Department of Defense and was based on extensive evidence about teamwork in high reliability organizations (e.g. military, commercial aviation and nuclear power plants) where errors are rare but have great consequences (Baker *et al.* 2006). In this framework, shared mental models were introduced as coordinating mechanisms that facilitate good teamwork behaviours (i.e. leadership, mutual performance monitoring, backup behaviour, adaptability and team orientation) (Salas *et al.* 2005) and were defined as 'an organizing knowledge structure of the relationships between the task the team is engaged in and how the team members will interact' (Baker *et al.* 2006, p. 1582).

Prior to this introduction into the health care context, shared mental models had been discussed since the 1990s when Cannon-Bowers and colleagues introduced the concept. They defined shared mental models as 'knowledge

structures held by members of a team that enable them to form accurate explanations and expectations for the task and in turn, to coordinate their actions and adapt their behaviour to demands of [their unique domain]' (Cannon-Bowers *et al.* 1993: p. 228). Since that time, the theoretical foundation has grown, particularly over the past 10–15 years.

The primary use of the shared mental model construct can be traced to the concept of mental models forwarded by Johnson-Laird (1983) as cognitive structures that humans use to simplify their environments. In other words, mental models can help humans describe, explain and predict what is happening around them (Rouse & Morris 1986), thereby reducing uncertainty (Klimoski & Mohammed 1994). When individuals interact, their mental models become similar over time and are often called shared mental models (Salas *et al.* 1992, McComb 2007). When team members possess shared mental models, they may possess similar views of the team's task and goals for accomplishing that task, the respective team members' unique roles that will be necessary for successful completion of the task, and appropriate strategies for approaching the task and how new information may alter those strategies (Cannon-Bowers *et al.* 1993).

The concept of shared mental models exists in many different fields of study, including psychology, cognitive science, computer science, organizational behaviour and now health care. The notion of individuals possessing cognition similar to the cognition of others around them has been studied under a myriad of labels including cognitive consensus (Mohammed & Ringseis 2001), group mind (Weick & Roberts 1993), interpretive schema (Bartunek 1984, Dougherty 1992), intersubjectivity (Eden *et al.* 1981), shared beliefs (Cannon & Edmondson 2001), shared cognition (Cannon-Bowers & Salas 2001, Tan & Gallupe 2006, DeChurch & Mesmer-Magnus 2010), shared meaning (Smircich 1983), sociocognition (Gruenfeld & Hollingshead 1993), team cognition (Fiore & Salas 2004), team mental model (Mohammed *et al.* 2010) and teamwork schema agreement (Rentsch & Klimoski 2001). Although both semantic and substantive differences may exist among these various constructs, the premise of developing similar world views that facilitate working together as a team remains the same. Thus, these concepts may be considered related concepts.

Another related concept under the broader concept of shared cognition is transactive memory (Wegner 1987, Liang *et al.* 1995, Brandon & Hollingshead 2004). Whereas shared mental models depict similarities among team members' knowledge about the context where they

are working, transactive memory depicts distributed knowledge. This construct, introduced by Wegner (1987), was developed to describe relationships between husbands and wives where each functions as extended memory for the other partner, particularly with respect to household tasks. In health care, a transactive memory system between nurses and physicians exists where each is aware of the unique and overlapping roles of the other in the provision of high-quality health care.

Two additional related concepts, which have undergone concept analysis, are collaboration (Henneman *et al.* 1995) and teamwork (Xyrichis & Ream 2007). Although these terms are often used interchangeably, Xyrichis and Ream (2007) distinguish them in their concept analysis. They suggest that both are the result of interaction, but teamwork requires that the interaction be interdependent. The interaction in both cases results in decision-making, but collaboration may result in unilateral decision-making, whereas a hallmark of teamwork is shared decision-making. Further confounding research around these two related concepts is the debate about the practicality of teamwork in health care even when overwhelming consensus suggests that interprofessional collaboration is a necessity (Millward & Jeffries 2001, McComb *et al.* 2012). Our purpose herein is not to further these useful clarifications of the types and significance of interprofessional interactions necessary for patient safety and outcomes. Rather, we discuss how shared mental models, our concept of interest, facilitate effective collaboration and teamwork, thereby suggesting that they are related concepts.

Defining attributes and demonstrative cases

Researchers contributing to the growing theory of shared mental models have suggested four defining attributes: content, similarity, accuracy and dynamics (Table 1). We focus much of our discussion on the content of shared mental models as this approach provides a good first step in expanding the view of shared mental models beyond the current unidimensional conceptualization prevalent in healthcare research. Moreover, this approach parallels the development of the concept in the team literature.

The definition of shared mental models offered by Cannon-Bowers *et al.* (1993) suggests the simultaneous existence of multiple mental models about a task, the team and team interaction. Over time, researchers have collapsed these content domains into two: (1) teamwork, representing the collaborative processes of teams; and (2) taskwork, representing the functional activities that must be accomplished (Mathieu *et al.* 2000, Smith-Jentsch *et al.* 2005). To

demonstrate how these two content domains (i.e. teamwork and taskwork) may influence the provision of care, we have developed two cases: (a) a model case depicting how shared mental model content may enhance interprofessional collaboration; and (b) a contrary case where the lack of shared mental model content inhibits interprofessional collaboration. The cases depict an excerpt from a telephone conversation between a home care nurse and the patient's primary care physician who have worked together extensively caring for patients in a rural area and have established a relationship based on respect for each other's roles.

Margaret Dunn, an 87-year-old diabetic widow, was discharged to her rural home, where she lives independently, 3 days ago post hospitalization for uncontrolled hyperglycemia. On admission to the hospital, her blood glucose was 380 mg/dL and her haemoglobin A1c was 13%. On discharge, her blood sugar was ranging between 130–160 mg/dL. Her vision is impaired and she has difficulty administering her own insulin and checking her blood sugar. She also has a slowly healing wound on her left great toe that requires daily wet to dry dressing changes. She is currently being visited by a home care nurse daily to care for the wound and monitor her ability to manage her diabetes.

The conversations all begin:

Nurse Good morning Dr. Simms, this is Susan Graver. I am the registered nurse from the visiting nurse

Table 1 Defining attributes.

Defining attribute	Definition	Sources
Content	The specific information and knowledge that comprise an individual's mental model.	McComb 2007, 2008, DeChurch & Mesmer-Magnus 2010, Mohammed <i>et al.</i> 2010,
Similarity	The commonality existing among team members' mental models.	McComb 2007, 2008, DeChurch & Mesmer-Magnus 2010, Mohammed <i>et al.</i> 2010,
Accuracy	The differences between an individual's mental model content and reality.	McComb 2008, DeChurch & Mesmer-Magnus 2010, Mohammed <i>et al.</i> 2010,
Dynamics	The need to respond to changes in the team's environment by updating existing mental models with new information or utilizing different mental models that are more applicable to the new circumstances.	Fowlkes <i>et al.</i> 2000, McComb 2007, 2008

association caring for Margaret Dunn. We have worked together before.

Physician Hi Susan, it is great to hear from you. I am glad Margaret has you as her nurse. Thanks for calling me. I have also been concerned about her since I discharged her home. How is she doing?

Exchanging these introductions and professional courtesies are critical to ensure that roles and past history are established. They provide a foundation for developing shared mental models. In the following cases, we pick up the conversation from this point.

Model case

Nurse I am here at Margaret's house and am very concerned about her current status. Would it be possible to have a care conference to discuss Margaret's ability to live alone?

Physician Are you concerned about her ability to manage her diabetes independently?

Nurse Yes, I am concerned that the same factors that led to her hospitalization will occur again if we do not quickly find resources and support systems for her since she lives alone out here in the country.

Physician I would agree, whom else should we involve in this discussion?

Nurse We might want to include her family along with the local Agency on Aging representative. The nurse managed clinic in the county might be able to provide some support as well.

Physician Do you think there are enough services in the area to be able to maintain her independently in her home?

Nurse I am unsure, this meeting should provide us with some of the information we need as I know Margaret would like to stay in her home if possible.

In this case, we see that the nurse and physician have shared mental models about both taskwork and teamwork. The taskwork mental model governing their actions is the belief that keeping patients independent and safely in the community is beneficial. From a teamwork perspective, the nurse and physician have a shared mental model about

using meetings with representatives of the care team and community service providers as a worthwhile approach to developing a plan that supports maintaining the patient in her own home.

Contrary case

Nurse I am here at Margaret's house and am very concerned about her current status. Would it be possible to have a care conference to discuss Margaret's ability to live alone?

Physician I am not sure that a care conference will be helpful, I was against Margaret going back to her home to begin with. She has minimal family left to help and there are no hospitals or health facilities nearby to provide support.

Nurse I would agree that it is a difficult situation, but Margaret had been doing fairly well until this last hospitalization and fears being sent to a nursing home. There is a nurse managed clinic nearby and a fairly strong Agency on Aging, would you be willing to have an initial discussion to see if we could provide the support needed?

Physician No, a meeting would be pointless. Meetings such as this rarely help and will not change the outcome. I knew from the outset that this would not work but was talked into allowing her to go home by others involved in her care.

As can be seen in this case, the nurse and physician do not have shared mental models about teamwork or taskwork. Specifically, the physician sees neither the need for a meeting of key players (teamwork mental model) nor the need to try everything necessary to keep Margaret Dunn living independently (taskwork mental model). Without the support of the physician, the resulting outcome could be that Margaret is forced to leave her home and move into an assisted living facility, thereby removing Margaret from her community against her will and possibly contributing to a decline in her emotional health. This lack of a shared mental model between the nurse and physician may impact their relationship as they work together on this case, as well as on other cases in the future.

To demonstrate the three remaining defining attributes of shared mental models, namely accuracy, similarity and dynamics (Table 1), we present the following two borderline cases also based on Margaret Dunn's scenario.

Borderline case I

Nurse I am here at Margaret's house and am very concerned about her current status. Would it be possible to have a care conference to discuss Margaret's ability to live alone?

Physician I am not sure that a care conference will be helpful, I was against Margaret going back to her home to begin with. Normally, I support getting patients back into their homes. But, she has minimal family left to help and there are no hospitals nearby to provide support.

Nurse I would agree that it is a difficult situation but Margaret had been doing fairly well until this last hospitalization and fears being sent to a nursing home. There is a nurse managed clinic nearby and a fairly strong Agency on Aging, would you be willing to have an initial discussion to see if we could provide the support needed?

Physician Well, if we can get one set up quickly to see if maintaining her at home is possible I would be supportive. But I truly do not believe she will be able to safely stay at home since my experience has been that generally in these rural areas it does not work.

The accuracy of the physician's mental model is questionable in this case as it appears to be strongly skewed by past experiences with patients living in rural areas who cannot get the support necessary to succeed in living independently and safely. This mental model does not appear to represent the services available in Margaret Dunn's locale. This inaccuracy is also impacting the amount of similarity between the mental models of the nurse and physician about both teamwork and taskwork. At a very general level, they similarly view the need to keep patient's living independently (taskwork mental model) and the utility of meetings to craft care plans (teamwork mental model). They do not, however, have very detailed shared mental models about either in this specific case because the physician is wary about Margaret Dunn's ability to live at home given her rural location. Finally, this case also demonstrates that a relationship among the various shared mental models simultaneously being used may exist. In other words, the physician's inaccurate view of Margaret Dunn's rural community has an impact on the ability of the physician and nurse to develop shared mental models about teamwork and taskwork.

Borderline case II

Nurse I am here at Margaret's house and am very concerned about her current status. Would it be possible to have a care conference to discuss Margaret's ability to live alone?

Physician Are you concerned about her ability to manage her diabetes independently?

Nurse Yes, I am concerned that the same factors that led to her hospitalization will occur again if we do not quickly find resources and support systems for her since she...oh no, Margaret just collapsed and appears nonresponsive.

Simultaneously, the physician and nurse say:

Nurse I need to go. I need to call 9-1-1.

Physician I have her address here in the file. I'll call 9-1-1 for you.

The abrupt change in Margaret Dunn's condition requires an equally abrupt shift in the mental models guiding the nurse and physician from taskwork mental models about the patient's ability to live independently to taskwork mental models about the need to address an emergency situation, thereby demonstrating how the dynamic defining attribute might impact shared mental models. In addition, this case demonstrates highly similar teamwork mental models about what needs to happen in an emergency situation as both providers simultaneously articulate the need to call 9-1-1.

Antecedents and consequences

Antecedents and consequences are described by Walker and Avant (2011, p. 167) as 'events or incidents that must occur or be in place prior to the occurrence of the concept' and 'events or incidents that occur as a result of the occurrence of the concept,' respectively. Some antecedents to developing shared mental models are obvious such as (a) two or more people collaborating as individuals must have someone with whom they can share their mental models and (b) communication among the collaborators informing their mental models and facilitating the convergence process that results in shared mental models among them. More relevant to the discussion, herein, may be the context where collaborators are functioning and the specific tasks in that context.

Different healthcare contexts may result in different ways teamwork will transpire (McComb *et al.* 2012), which in turn suggests that mental model content may be context

dependent. In the healthcare domain, context may be related to extant knowledge about teammates and their roles. For instance, often physicians may not have a strong mental model about the capabilities and responsibilities of the nurses with whom they work, such as the home care nurse in our cases. Developing mental models about how to interact and how to proceed with care may prove difficult if the collaborators do not first have a shared mental model about their respective roles. Such a shared mental model may require explicit conversations or may develop over time as two professionals have the opportunity to work together and gain appreciation for each individual's respective capabilities and responsibilities. Whether explicit or evolving over time, however, active effort and engagement on the part of the individuals involved is required for the effective development of shared mental models (Kalisch 2009).

Context may also be a function of training or protocols established by the organization where teamwork is being undertaken. The Situation, Background, Assessment and Recommendation (SBAR) tool designed to facilitate handoff communication is an excellent example of a protocol that supports the development of shared mental models about care by delivering information in a systematic manner that is understandable to all involved (Haig *et al.* 2006).

Similarly, specific task requirements may drive different teamwork skills (McComb *et al.* 2012) and, therefore, mental model contents (McComb & Kennedy 2011). For example, in an operating suite with a surgical team that has worked together regularly and is collaborating on a routine surgical procedure (e.g. knee replacement), the protocols that govern the specific procedure and those that the team has developed over time will comprise their mental models. Alternatively, nurses and physicians collaborating around patient care on a general medical unit may find difficulty in developing shared mental models because of: (1) the wide array of care they provide across the multiple patients for which they are caring; (2) the changing team membership attributable to both shift rotations and changing patient needs; and (3) the aforementioned contextual issues associated with limited knowledge about roles and capabilities as well as inexperience working with specific members.

Overall, shared mental models have been found to have positive consequences on a variety of outcomes. In a recent meta-analysis, DeChurch and Mesmer-Magnus (2010) found that shared mental models positively predict task-related processes, motivational states and performance. Their findings suggest that in addition to a direct impact on performance, shared mental models also enhance

performance indirectly by enabling more effective team processes that in turn result in higher team performance.

Empirical referents and shared mental model definition

Given that shared mental models exist in individual team members, identifying their existence in the real world may prove difficult. Much of the research on shared mental models in the broader team literature has focused on either: (a) mental model structural similarity using pairwise comparisons, concept mapping, etc.; or (b) perceptual similarity through assessments of the similarity among responses to Likert-type scales (DeChurch & Mesmer-Magnus 2010). Other studies have examined team communication to identify when shared mental models exist throughout team communication (e.g. McComb *et al.* 2010). The onus on scholars is to carefully articulate exactly what attributes of shared mental models they are examining and develop a measurement approach that will accomplish their goals. The following definition, based on the growing body of literature focused specifically on shared mental models, may provide guidance to scholars as they consider how to incorporate this concept into their studies.

Shared mental models are individually held knowledge structures that help team members function collaboratively in their environments and are comprised of four attributes: content, similarity, accuracy and dynamics. An individual may simultaneously employ multiple mental models each comprised of specific 'content'. To be considered shared, the team members' mental models must have some degree of 'similarity'. The usefulness of the shared mental models may be a function of this degree of similarity, and the level of 'accuracy' with which they represent reality. Finally, shared mental models are 'dynamic' in that they change over time as situations change and new information is integrated.

Discussion

Through our theoretically grounded concept analysis, we endeavour to lay the foundation for a middle-range descriptive theory of shared mental models in health care. To that end, we have refined the concept of shared mental models introduced in taxonomies of effective healthcare teamwork, such as TeamSTEPPS, by grounding it in the theoretical literature about shared mental models found in the broader team literature. Such linkages demonstrate the applicability of the concept to nurses, as well as other healthcare professionals, in the global workforce across all kinds of delivery

settings, while taking advantage of the extant theoretical basis available from other disciplines.

From a nursing theory development perspective, we focus at the theoretical level of abstraction while maintaining linkages to the philosophical and empirical levels (Smith & Liehr 2003). Specifically, we provide defining attributes that can be used to design empirical tests of the shared mental model concept and to apply the concept in practice. In addition, we embed our concept analysis in the interactive–integrative paradigmatic perspective of nursing (Newman *et al.* 1991), in that nurses are interacting entities that provide care in a specific context. Mental models fit in this perspective because, as they become shared among providers, they facilitate the interactive and integrative nature of nursing practice and safe care delivery.

Embedding shared mental models in the interactive–integrative paradigm also facilitates connections to other nursing concepts and theories. King's (1971) Conceptual System and Middle-Range Theory of Goal Attainment: (1) provides an example of how an existing nursing concept may be useful when specifying the defining attributes of shared mental models in a particular context; and (2) demonstrates how an existing theory may be enhanced through insights from the shared mental model concept. First, King's Conceptual System suggests that nursing occurs in interdependent, hierarchical systems including personal systems at the individual level, interpersonal systems at the group level and social systems at the societal level. These systems depict the context where care must be delivered. Therefore, they may be instrumental in helping to identify the relevant mental model content that might enhance collaboration for a specific patient. Second, King's Middle-Range Theory of Goal Attainment suggests that nurses and patients work towards achieving the mutually set goals for the patient's care by undertaking an interactive process of actions, reactions, interactions and transactions based on their individual perceptions and judgments as well as feedback received through the process. The concept of shared mental models may provide a robust approach for characterizing perceptions and judgments, as mental models are frameworks that help individuals perceive and make judgments about the world around them. As the nurse and patient interact, their mental models may become shared, leading to greater similarity in their perceptions and judgments and, presumably, enhancing the delivery of appropriate care to the patient. In practice, understanding the concept of shared mental models and how they are attained may facilitate an expedited process of developing shared mental models, thereby having the potential to accelerate goal attainment.

Limitations

As with all research, ours is not without limitations. The lack of research available related to shared mental models in the nursing literature may be viewed as a limitation. We, however, view this lack of research about a concept that is extremely important to teamwork in the healthcare domain as an opportunity to infuse the theoretical development from the greater team literature to the specific case of teamwork in health care. As well, even though our cases depict a relationship between a nurse and a physician, the term 'physician' was not used as a search term, instead we used broader terms like 'collaboration' and 'teamwork' to identify research about shared mental models that included all types of healthcare providers.

Conclusion

Nurses are embedded in complex healthcare environments with a strong and growing emphasis on high quality, safe care. Provision of such care relies not only on the ability to work effectively with other disciplines but also the ability to develop shared mental models about said care. Moreover, the shared mental models should, at a minimum, represent both the care plan (i.e. the taskwork) and how that plan will be executed by the care team (i.e. the teamwork). Developing shared mental models, however, can be difficult.

In the practice setting, nurses, doctors and certified nursing assistants all go about their day doing what they have always done, unaware of the role that shared mental models can play. Training programmes may help to support development and refinement of shared mental models that facilitate effective teamwork and collaboration among care providers. More importantly, such training efforts can be designed to make healthcare providers aware of the impact that shared mental models have not only on their working relationships, but also on the care of patients/clients.

Awareness of the potential positive impact of shared mental models on care provision does not have to wait until healthcare professionals are practicing. For instance, beginning interprofessional collaborations during the education of doctors, nurses, pharmacists, therapists, etc. allows these providers to develop an understanding of the roles that they play in the healthcare system and be attuned to the benefits of effective interprofessional collaboration and teamwork facilitated by shared mental models. This knowledge, in turn, provides solid foundations for further enhancements on entrance into the healthcare arena as providers.

Funding

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Conflict of interest

No conflict of interest has been declared by the authors.

Author contributions

All authors have agreed on the final version and meet at least one of the following criteria [recommended by the ICMJE (http://www.icmje.org/ethical_1author.html)]:

- substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data;
- drafting the article or revising it critically for important intellectual content.

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