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Defining and Measuring Decision-Making for the Management of Trauma Patients

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BACKGROUND: Effective management of trauma patients is heavily dependent on sound judgment and decision-making. Yet, current methods for training and assessing these advanced cognitive skills are subjective, lack standardization, and are prone to error. This qualitative study aims to define and characterize the cognitive and interpersonal competencies required to optimally manage injured patients.

METHODS: Cognitive and hierarchical task analyses for managing unstable trauma patients were performed using qualitative methods to map the thoughts, behaviors, and practices that characterize expert performance. Trauma team leaders and board-certified trauma surgeons participated in semistructured interviews that were transcribed verbatim. Data were supplemented with content from published literature and prospectively collected field notes from observations of the trauma team during trauma activations. The data were coded and analyzed using grounded theory by 2 independent reviewers.

RESULTS: A framework was created based on 14 interviews with experts (lasting 1-2 hours each), 35 field observations (20 [57%] blunt; 15 [43%] penetrating; median Injury Severity Score 20 [13-25]), and 15 literary sources. Experts included 11 trauma surgeons and 3 emergency physicians from 7 Level 1 academic institutions in North America (median years in practice: 12 [8-17]). Twenty-nine competencies were identified, including 17 (59%) related to situation awareness, 6 (21%) involving decision-making, and 6 (21%) requiring interpersonal skills. Of 40 potential errors that were identified, root causes were mapped to errors in situation awareness (20 [50%]),

decision-making (10 [25%]), or interpersonal skills (10 [25%]).

CONCLUSIONS: This study defines cognitive and interpersonal competencies that are essential for the management of trauma patients. This framework may serve as the basis for novel curricula to train and assess decision-making skills, and to develop quality-control metrics to improve team and individual performance. (J Surg Ed ∎:∎∎∎-∎∎∎. © 2017 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: trauma, decision-making, judgment, competency, expertise, surgical education

COMPETENCIES: Patient Care, Medical Knowledge, Interpersonal and Communication Skills, Systems-Based Practice

INTRODUCTION

Decisions in trauma scenarios often must be made in a high stress and chaotic environment. Clinicians are often faced with limited time, insufficient information about the patient's injuries and the possibility that unanticipated events will arise. As a result, there is a high potential for errors to be made during the management of injured patients, and this seems to be especially true during the early assessment and resuscitation phases, when initial life-saving interventions are undertaken.[1,2] Several studies have shown high rates of preventable adverse events amongst surgical patients, most of which are related to errors in cognitive factors as well as other aptitudes such as teamwork and communication.[3-6] Therefore, the ability of the trauma team to exercise sound judgment and make timely and effective decisions is paramount in order to improve performance, avoid pitfalls that can lead to clinical deterioration, and ultimately optimize patient outcomes.[1,7]

These skills are broadly referred to as *nontechnical skills*, and are generally categorized into cognitive and interpersonal skills that are required for the satisfactory completion of a task as opposed to the necessary technical expertise.[8]

Yet, despite their importance, our current understanding of these skills remains limited. A considerable volume of research in cognitive psychology has attempted to gain insight into how decisions are made in natural and high-stakes environments, such as when managing a trauma patient.[9,10] Naturalistic decision-making theory involves the study of decisions and behaviors in operational environments in order to account for the realities of the real world, where time is limited, the stakes are high, information is limited, and conditions are suboptimal, uncertain and dynamic.[11,12] Decision-makers therefore strive to make satisfactory decisions in a timely manner, often using the first acceptable course of action using one's gut feeling and intuition. Nevertheless, these remain theoretical constructs and descriptions of mental processes that have limited applications for improving patient care. There are still many gaps in our current understanding of how experts make effective decisions and the behaviors and high-level cognitive competencies that define their performance. More importantly, current methods of teaching and assessing these skills tend to be subjective, lacking in standardization, and prone to error, likely due to their abstract nature.[13]

As a first step, there is a need for these complex skills to be better characterized in order to understand the construct of expertise in trauma care. Such a framework could subsequently be used to design novel training programs in order to systematically and effectively teach these skills, develop objective, and measurable performance metrics that reflect patient outcomes, and implement quality-control interventions for improving team performance. The purpose of this study was to define the cognitive and interpersonal competencies necessary to effectively manage injured patients.

METHODS

In order to map out the thoughts, behaviors, and practices that characterize expertise in the care of trauma patients, qualitative methodologies were used to perform a task analysis, followed by a constructivist grounded theory approach for data analysis and development of a conceptual framework. The study protocol was approved by the institutional review board and conforms to the Canadian Tri-Council Policy Statement of Ethical Conduct.

Task Analysis

Task analyses entail using various techniques to systematically decompose complex tasks into their constituent elements in order to yield information about the knowledge, thought processes, and goal structures that underlie the performance of such tasks.[14] In this study, 2 different forms of task analysis were used in conjunction: an action-oriented approach (hierarchical task analysis; HTA) and a cognitive approach (cognitive task analysis). HTA involves identifying in a top down fashion the overall goals of a task, as well as the various subtasks and conditions under which they should be carried out in order to achieve that goal. As such, HTA is focused more on defining observable actions. Cognitive task analysis, on the contrary, uses a variety of interview and observational strategies to capture a description of the knowledge and mental processes that experts use to perform complex tasks.[15] This methodology is particularly useful for complex and dynamic tasks that are highly dependent on higher-order cognitive functions (such as when managing a trauma patient), allowing us to capture mental processes used by experts to reliably achieve a desired performance standard.[16,17]

Data Collection

To perform the task analysis, a combination of qualitative modalities was used, each designed to extract subject matter experts' (SME) thoughts, behaviors, and practices in trauma management: semistructured interviews of SMEs, field ("in vivo") observations of the trauma team, and content analysis of the literature. In this study, SMEs composed of board-certified trauma surgeons and emergency physicians who take trauma team leader call at Level 1 trauma centers. SMEs were sampled to represent various demographics, geographic locations, surgical subspecialties, and training backgrounds in order to develop a more comprehensive understanding of the underlying construct.

After obtaining informed consent, SMEs participated in semistructured interviews conducted either in person or through videoconference and teleconference by 1 or 2 investigators (A.M. and A.G.), with formal training in qualitative research methodologies. Using broad, open-ended questions, the interviewee was initially prompted to discuss their general initial approach for managing a trauma patient after receiving an activation. An activation was defined as a scenario during which the entire multidisciplinary team is immediately alerted to the trauma resuscitation unit to assess a critical patient. SMEs were asked to identify their objectives, tasks, key steps, and major decisions that must be made throughout the management process. In addition, the interviewee was asked to recall 1 or 2 recent cases and describe it in detail from start to finish. A template of questions was used to guide the interviews (Table 1) to elicit details about mental processes. Close-ended dichotomous questions and interruption of dialog by the interviewer were avoided in order to avoid bias or leading questions, and to encourage free-flowing discussion.