Applied Ergonomics xxx (2016) 1–11

Contents lists available at ScienceDirect

Applied Ergonomics

journal homepage: www.elsevier.com/locate/apergo

Resilience skills as emergent phenomena: A study of emergency departments in Brazil and the United States

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ARTICLE INFO

Article history:
Received 9 November 2015
Received in revised form
21 February 2016
Accepted 26 February 2016
Available online xxx

Keywords:
Resilience skills
Resilience engineering
Complexity
Emergency department

ABSTRACT

Although the use of resilience skills (RSs) by emergency department (ED) front-line staff is ubiquitous, the nature and origin of these skills tend to be taken for granted. This study investigates the research question "where do RSs come from"? Case studies in two EDs were undertaken in order to answer the research question: one in Brazil and the other in the United States. The case studies adopted the same data collection and analysis procedures, involving interviews, questionnaires, observations, and analysis of documents. A model for describing RSs as emergent phenomena is proposed. The model indicates that RSs arise from interactions between: work constraints, hidden curriculum, gaps in standardized operating procedures, organizational support for resilience, and RSs themselves. An instantiation of the model is illustrated by a critical event identified from the American ED. The model allows the identification of leverage points for influencing the development of RSs, instead of leaving their evolution purely to chance.

1. Introduction

Healthcare systems are widely regarded as primary examples of complexity, due to characteristics such as uncertainty, diversity, tightly-coupled processes, large number of dynamically interacting elements, and resilience (Amalberti, 2013; Hollnagel et al., 2013). This research study is concerned with resilience, which is "the intrinsic ability of a system to adjust its functioning prior to, during, or following changes and disturbances, so that it can sustain required operations under both expected and unexpected conditions" (Hollnagel, 2011, p. XXXVI). In turn, performance adjustment means filling in the gaps of standardized operating procedures (SOPs), whatever their extent and reason (Saurin et al., 2014).

Emergency departments (EDs) have been one of the main healthcare laboratories for investigating resilience (Stephens et al., 2011). This is due to the highly dynamic work environment of EDs, in which following SOPs is far from sufficient – and may sometimes be counterproductive – for providing effective care to patients. The most visible manifestations of resilience in EDs are associated with the performance of front-line employees, often without adequate support from organizational design (Wears and Vincent, 2013). Organizational support would imply system configurations and artifacts that become the instruments by which resilience is brought to bear (Fairbanks et al., 2014).

One of the means for providing organizational support is to influence the development of the resilient skills (RSs) of the workforce. These are the "skills of any type necessary to adjust performance, in order to maintain safe and efficient operations during both expected and unexpected situations" (Saurin et al., 2014). In turn, a skill is a goal-oriented, well-organized behavior performed with economy of effort (Proctor and Dutta, 1995).

Other terms have been used in the human factors literature to refer to similar concepts – e.g. improvisations (Trotter et al., 2013), tacit skills (Ambrosini and Bowman, 2001), and non-technical skills, NTS (Flin et al., 2008). Overall, commonalities between these concepts are the use of the individual or team as the unit of analysis, and their concern with performance for dealing with unexpected situations.

We opted for RSs mostly because we approach this concept from

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http://dx.doi.org/10.1016/j.apergo.2016.02.012
0003-6870/

the perspective of resilience engineering (RE), which is concerned with the observation, analysis, and design of resilient systems (Nemeth and Herrera, 2015). RE stresses the creation of organizational conditions that support resilient performance at the sharp end (Bergström et al., 2015). This is a distinctive commitment of RE, and therefore of RSs, in relation to the previously mentioned similar concepts. While RE does not deny that personal qualities matter (Reason, 2008), it counters the tendency to over-valuing "heroic" behaviors of practitioners (Schulman, 1996) and relying excessively on elite performers (Ericsson et al., 2006).

Regardless of the ubiquitous presence of RSs in EDs, little is known on how they arise. RSs and resilience in general are often regarded as emergent phenomena (Bracco et al., 2008; Nemeth et al., 2011; Day, 2005). This conveys the idea that interactions between agents "set the stage" for resilient performance, which cannot be developed and deployed in a fully controlled manner. While it is intuitive that RSs arise from interactions, there is no framework for tracking the factors intervening in these interactions neither for analyzing how these can be influenced. Indeed, while observations of resilience in healthcare have been frequently reported in literature, these have not yet revealed where resilience comes from, neither what supports or degrades it (Nemeth and Herrera, 2015). Also, there is a need for providing empirical evidence to support the notion that RSs are emergent.

This research deals with the gap aforementioned ("where do RSs come from?") through the investigation of RSs in two EDs: one in Brazil, and the other in the United States. While both EDs share similar characteristics, they also have marked contextual differences, thus offering a rich empirical basis for investigating the origins and role of context on RSs. A model of the interactions leading to RSs is offered as an alternative for answering the research question.

2. Resilience in emergency departments

Healthcare and EDs in particular has been a domain of interest for RE. Wears et al. (2006) described how the resilient capacity of an ED was exceeded due to overcrowding. Stephens et al. (2011) reported how resilient performance relied on interactions with other areas of the hospital. Perry et al. (2006) described how shared decision-making, involving professionals who had never worked together, was crucial for the successful treatment of a pregnant patient in an ED. Anders et al. (2006) assessed five characteristics of resilience in the trauma area of an ED: buffering capacity, flexibility, margin, tolerance, and cross-scale interactions. Sujan et al. (2015) investigated how the study of everyday clinical work offered insights into patient safety in handover activities carried out in an ED. Anderson et al. (2013) proposed a framework for managing the four abilities of resilient organizations in an ED: anticipating, monitoring, responding, and learning. Wears and Perry (2008) explored the use of system dynamics for modeling resilience and brittleness in overcrowded EDs.

Overall, previous studies on resilience in EDs had a stronger focus on the observation of resilience, placing less emphasis on analysis and design. Furthermore, while a number of contextual factors that trigger resilience may be identified from these studies, this information is mostly a by-product rather than the main research objective.

3. Emergence

Emergence is widely regarded as a defining characteristic of complexity (Dekker, 2011). Emergent phenomena arise from the interactions among several variables, and they have unique properties that are not found in any of the interacting variables (Cilliers, 1998). Such phenomena may be either desired or undesired (Buchli and Santini, 2005), and while they cannot be fully controlled they can be influenced to some extent.

A metaphor commonly used to explain emergence is that the whole is more than the sum of the parts – less emphasized, but also noticed by Cilliers (1998) is the fact that emergence can imply the whole is less than the sum of the parts. Indeed, Heylighen et al. (2007) note that not only is the behavior of the whole influenced by the properties of its parts, but the behavior of the parts is to some degree constrained by the properties of the whole. Thus, given its nature, the investigation of emergence must stress the interactions between parts, rather than the parts themselves – of course, knowing the parts is important but not the key for understanding (Dekker, 2011). For the purposes of this study, investigating RSs as emergent phenomena means that we are concerned with how interactions between the elements forming a sociotechnical system give rise to RSs.

4. Research method

4.1. Research strategy

In order to investigate RSs, two case studies were carried out. This research strategy was chosen mostly because case studies (Flyvbjerg, 2011) are a means for developing context-dependent knowledge, which is a key for accelerating the learning process of novices. Premises of case study design were followed in order to increase the credibility of the findings, as follows: (i) identification of literature gap; (ii) development of data collection protocols (Eisenhardt and Graebner, 2007); (iii) intentional selection of cases (Flyvbjerg, 2006); (iv) delimitation of the boundaries of the case Flyvbjerg (2011); (v) triangulation of data and data sources (Noor, 2008); (vi) development of a database, allowing traceability and reinterpretation of data when necessary (Flybjerg, 2011); and (vii) use of visual representations to illustrate the contributions of the study (Eisenhardt and Graebner, 2007).

The case studies were undertaken in the EDs of two University hospitals: one in Brazil and the other in the United States. The research project was approved by the ethical committees of both hospitals. The main reasons for selecting these cases were: (i) they had been objects of recent RE studies (Righi and Saurin, 2015; Righi et al. 2016; Wears et al., 2007; Wears and Perry, 2008), which made it easier access for data collection and facilitated acclimation of the researchers; (ii) they were EDs of reference in their respective regions, which suggested staff was highly qualified; and (iii) their academic nature, which could encourage critical thinking.

The studies focused on the work of the three categories of professionals mostly involved in patient care, namely physicians, nurses, and nurse technicians. The focus on front-line staff was mostly due to immediate impact of their actions on patient safety and ED performance, in addition to the ease of observation.

A premise for the field study was that the unit of analysis should be the joint cognitive system (JCS) formed by the interactions between the individual professional and their social and material environment. According to Hollnagel and Woods (2005), a JCS is a co-agency between people and technology that uses the knowledge about itself and the environment to plan and modify its actions in order to achieve a goal. A JCS not only uses what is inside people's minds, but also representations distributed along the social and material structures (Hollan et al., 2000). Therefore, data collection was not only concerned with the identification of RSs

Please cite this article in press as: Wachs, P., et al., Resilience skills as emergent phenomena: A study of emergency departments in Brazil and the United States, Applied Ergonomics (2016), http://dx.doi.org/10.1016/j.apergo.2016.02.012