



## Review

# Traditions of research into interruptions in healthcare: A conceptual review



Tara McCurdie<sup>a,\*</sup>, Penelope Sanderson<sup>b</sup>, Leanne M. Aitken<sup>c,d</sup>

<sup>a</sup> School of Information Technology and Electrical Engineering, The University of Queensland, Brisbane 4072, Australia

<sup>b</sup> Schools of Information Technology and Electrical Engineering, of Psychology, and of Medicine, The University of Queensland, Brisbane, Australia

<sup>c</sup> School of Nursing & Midwifery, Menzies Health Institute Queensland, Griffith University, Brisbane, Australia

<sup>d</sup> School of Health Sciences, City University London, London, United Kingdom

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## ABSTRACT

**Background:** Researchers from diverse theoretical backgrounds have studied workplace interruptions in healthcare, leading to a complex and conflicting body of literature. Understanding pre-existing viewpoints may advance the field more effectively than attempts to remove bias from investigations. **Objective:** To identify research traditions that have motivated and guided interruptions research, and to note research questions posed, gaps in approach, and possible avenues for future research.

**Methods:** A critical review was conducted of research on interruptions in healthcare. Two researchers identified core research communities based on the community's motivations, philosophical outlook, and methods. Among the characteristics used to categorise papers into research communities were the predominant motivation for studying interruptions, the research questions posed, and key contributions to the body of knowledge on interruptions in healthcare. In cases where a paper approached an equal number of characteristics from two traditions, it was placed in a blended research community.

**Results:** A total of 141 papers were identified and categorised; all papers identified were published from 1994 onwards. Four principal research communities emerged: epidemiology, quality improvement, cognitive systems engineering (CSE), and applied cognitive psychology. Blends and areas of mutual influence between the research communities were identified that combine the benefits of individual traditions, but there was a notable lack of blends incorporating quality improvement initiatives. The question most commonly posed by researchers across multiple communities was: what is the impact of interruptions? Impact was measured as a function of task time or risk in the epidemiology tradition, situation awareness in the CSE tradition, or resumption lag (time to resume an interrupted task) in the applied cognitive psychology tradition. No single question about interruptions in healthcare was shared by all four of the core communities.

**Conclusions:** Much research on workplace interruptions in healthcare can be described in terms of fundamental values of four distinct research traditions and the communities that bring the values and methods: of those research traditions to their investigations. Blends between communities indicate that mutual influence has occurred as interruptions research has progressed. It is clear from this review that there is no single or privileged perspective to study interruptions. Instead, these findings suggest that researchers investigating interruptions in healthcare would benefit from being more aware of different perspectives from their own, especially when they consider workplace interventions to reduce interruptions.

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## What is already known about the topic?

- Researchers from diverse theoretical backgrounds have studied workplace interruptions in healthcare, leading to a complex and sometimes conflicting body of literature.
- Researchers' pre-existing biases and beliefs may guide their assumptions about interruptions, such as whether or not interruptions are fundamentally negative, and the questions they ask.
- Despite calls to reduce bias, our understanding of workplace interruptions in healthcare may never be free of pre-existing beliefs and assumptions that guide investigations and interventions.

\* Corresponding author.

E-mail address: [t.mccurdie@uq.edu.au](mailto:t.mccurdie@uq.edu.au) (T. McCurdie).

### What this paper adds

- Much research on workplace interruptions in healthcare can be described in terms of fundamental values of four distinct research traditions: epidemiology, quality improvement, cognitive systems engineering, and applied cognitive psychology, although some papers blend traditions.
- Research questions about interruptions in healthcare are not universally shared across communities.
- A greater awareness of the role that research traditions play in framing investigations of workplace interruptions in healthcare will help researchers detect assumptions, interpret apparent inconsistencies, and close gaps in knowledge.

## 1. Introduction

Research into the impact of interruptions on the quality and safety of healthcare work has burgeoned over the last fifteen years. Early studies noted that interruptions seemed to be associated with medication errors (Fuqua and Stevens, 1988; Scholz, 1990; Walters, 1992). Subsequently, interruptions have been associated with lost time (Elganzouri et al., 2009), cognitive failures (Dismukes, 2012; Elfering et al., 2014), and staff and patient frustration (Dearden et al., 1996). Interruptions have also been associated with positive outcomes, such as conveying critical information by way of alarms (Sasangohar et al., 2012), clinical decision support systems (Walji et al., 2004a), and person-to-person communication (Laxmisan et al., 2007). Some researchers have recommended that the number of interruptions be reduced, whereas others have encouraged practitioners to use them to increase efficiency (Walji et al., 2004a). Commentaries and reviews of interruptions in healthcare also reflect conflicting views and differing conclusions (Dismukes, 2012; Sasangohar et al., 2012; Biron et al., 2009a; Grundgeiger and Sanderson, 2009; Rivera-Rodriguez and Karsh, 2010; Hopkinson and Jennings, 2013; Li et al., 2011; Boehm-Davis and Remington, 2009; Coiera, 2012; Westbrook, 2013). It is therefore not surprising that despite extensive efforts to guide mitigation strategies, the effectiveness of interventions remains mixed (Raban and Westbrook, 2013).

In their useful review of interruptions in healthcare, Hopkinson and Jennings (2013) suggest an explanation for conflicting outcomes: “Our assumptions about interruptions likely guide the development of data collection instruments that, in turn, may interfere with a grasp of interruptions that is free from the constraints of pre-existing beliefs and biases” (p. 12). Hopkinson and Jennings note that if researchers assume that interruptions have only negative effects then they may overlook the potential positive effects of interruptions. At some level, researchers’ grasp of interruptions may never be free of pre-existing beliefs and biases, given that biases are deeply held, unquestioned assumptions held to be self-evident. However, if researchers were more thoroughly aware of the beliefs and biases of the varying communities studying interruptions in healthcare, including their own, they could potentially interpret findings more accurately, identify differing conclusions and gaps in evidence more clearly, and make more considered designs about what, if anything, to do about workplace interruptions in healthcare.

When faced with an equally complex, heterogeneous, and conflicting body of literature Greenhalgh et al. (2005, 2009) developed a *meta-narrative method* as a way of making sense of tensions and paradoxes across research traditions. Citing the role of Kuhn’s (1962) scientific paradigms, Greenhalgh et al. (2005) notes, “Any group of researchers views the world through a particular ‘lens’ or paradigm that has four dimensions: conceptual (what are considered the important objects of study and, hence,

what counts as a legitimate problem to be solved by science), theoretical (how the objects of study are considered to relate to one another and to the world), methodological (the accepted ways in which problems might be investigated) and instrumental (the accepted tools and techniques to be used by scientists)” (pp. 418–419). Greenhalgh and colleagues posed five questions about a tradition: (1) its parameters and theoretical basis, (2) the questions it asks, (3), its main findings, (4) how it has unfolded over time, and (5) its strengths and limitations. We used this framework to better illustrate pre-existing viewpoints in the conflicting body of interruptions literature.

Our goal in this paper was to conduct a broad analysis of the research on interruptions in healthcare, referring to aspects of the above view. Specifically, we explored the following: (i) different research traditions and disciplines that are currently contributing to interruptions research, (ii) how communities studying interruptions in healthcare bring the values and methods of one or more research traditions to their investigations, (iii) how those traditions, or worldviews, shape the questions that are asked about interruptions.

## 2. Method

To guide our critical review, we adopted some elements of the meta-narrative approach to systematic review outlined by Greenhalgh et al. (2005) (see Fig. 1). We undertook a broad initial review of papers published on interruptions research in the healthcare domain. The broad review led to a preliminary conceptualization of the perspectives and approaches employed by the various research communities. Then we performed a more systematic search of the literature as the emerging communities and their values evolved.

The criteria for including papers in the review were: (i) either the context was healthcare or the authors stated that the results were relevant to healthcare (ii) the primary focus was workplace interruptions (or disruptions or distractions) and (iii) the paper was written in English. All types of full-length papers were eligible for inclusion, including empirical papers, conference papers, theoretical papers, and commentaries, and therefore excluding abstracts. We did not specify a particular date range in our search for literature, but instead chose to include all papers that matched the inclusion criteria stated above. Papers from any healthcare setting were included. The inclusion criteria were set broadly so that a wide variety of papers, and therefore perspectives, could be considered.

Our search was conducted with the online database Web of Science using the following search phrases: (i) healthcare AND interrupt\* (ii) health care AND interrupt\* (iii) interrupt\* AND nurs\* (iv) healthcare AND distract\* (v) health care AND distract\*. Google Scholar and Google Scholar Alerts using similar free text search terms further supplemented the list of reviewed papers. It has been noted that there is variation in how interruptions are defined (Coiera, 2012; Grundgeiger et al., 2015), and also whether interruptions or distractions differ or are terms that can be used interchangeably. Given this recognition and our desire to be as inclusive as possible, we have not attempted to use a single definition of interruptions, but have accepted any definition used by authors. Collaborators also provided relevant papers they thought might meet the inclusion criteria. A further search through reference lists yielded additional papers meeting the inclusion criteria. References were also analysed for books and papers that appeared to be seminal authorities for the research.

The full-text papers were independently reviewed and categorised by two reviewers [TMCC and PS]. We used some provisional characteristics to perform an initial categorisation of

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