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Review

Interruptions in healthcare: Theoretical views

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ABSTRACT

Background: Researchers in healthcare have begun to investigate interruptions extensively, given evidence for the adverse effects of work interruptions in other domains and given the highly interruptive hospital environment. In this paper, we reviewed literature on interruptions in critical care and medication dispensing settings in search of evidence for a relationship between interruptions and adverse events.

Methods: The literature search included the databases MEDLINE, CINAHL + Pre CINHAL, Health Sources: Nursing Academic Edition, EMBASE, PsycINFO, ISI Web of Science and Ergonomics Abstracts. The paper titles and abstracts were subsequently reviewed. After the initial search, we reviewed paper titles and abstracts to define the subset for review.

Results: We currently lack evidence in healthcare of the extent to which interruptions lead to adverse effects. The lack of evidence may be due to the descriptive rather than causal nature of most studies, the lack of theory motivating investigations of the relationship, the fact that healthcare is a complex and varied domain, and inadequate conceptualizations of accident aetiology. We identify two recent accident theories in which the relationship between activity and medical errors is complex, indicating that even when it is sought, causal evidence is hard to find.

Discussion: Future research on interruptions in healthcare settings should focus on the following. First, prospective memory research and distributed cognition can provide a theoretical background for understanding the impact of interruptions and so could provide guidance for future empirical research on interruptions and the planning of actions in healthcare. Second, studying how interruptions are successfully rather than unsuccessfully overcome may better help us understand their effects. Third, because interruptions almost always have positive and adverse effects, more appropriate dependent variables could be chosen.

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1. Introduction

There are many aspects of healthcare working conditions that, if changed, could reduce the incidence of medical errors. In 2003 the Agency for Healthcare Research and Quality (AHRQ) published an evidence report which states that reducing interruptions and distractions will probably reduce the number of medical errors [1]. However, the AHRQ's conclusion is based on evidence from aviation [2] and from a study on medication dispensing errors [3]. The AHRQ authors add that the “evidence of the association between interruptions and distractions and errors in other areas of medicine is insufficient” [1, p. 34].

Given that medical staff are interrupted frequently [4–6], given that interruptions disrupt human cognition [7,8], and given the evidence from other domains [2], it may be that the research approaches chosen are inappropriate rather than that there is no relation between interruptions and medical errors. Therefore, it is more likely that there is absence of evidence than evidence of absence [9,10] for an effect of interruptions on medical errors.

In Section 2, we summarize recent studies on interruptions and distractions in critical care areas and medication dispensing. We conclude that (1) evidence for a relation between interruptions and medical errors is still weak, probably more because of methodological approaches than because there is evidence that the relation is absent, (2) different definitions of interruptions are used by different researchers, making it hard to compare studies, (3) the papers reviewed lack theoretical background that could be useful when investigating interruptions, and (4) generalizations from the aviation to the medical domain may not always be appropriate.

In Section 3, first we discuss *prospective memory*, which is the ability to recall a previously formed intention at a specific time or cue in the future without being encouraged to do so [11]. Second, because 21 out of the 35 papers reviewed consider memory failures to be a direct result of interruptions, we use prospective memory as theoretical background to interpret the effects of interruptions. Third, we discuss differences and similarities between the medical and aviation domain that influence the effect of interruptions on memory. The section ends with implications of prospective memory for information technology (IT) systems.

In Section 4, we address the role of interruptions in adverse events. First, we contrast the evidence-based approach in the papers reviewed with Reason's Swiss cheese model [12] and Hollnagel's systemic accident model [13]. We conclude that the accident models capture the complex nature of interruptions better. Second, in line with Hollnagel's systemic accident model [13], we suggest that observing how people overcome interruptions could offer new insights into the processes affected by interruptions. Third, we argue that interruptions are not generally “bad” or “good”. To understand the effects of interruptions, researchers need to choose appropriate dependent variables. The final part of the section addresses implications of the systemic accident model for healthcare informatics.

2. Review on interruptions in the medical domain

We undertook a broad review of recent papers published on interruptions in the medical domain. The AHRQ report covers the period up to 2002, so our search was restricted to papers in English written after 2002. An initial search was conducted in the databases MEDLINE, CINAHL+Pre CINHAL, Health Sources: Nursing Academic Edition, EMBASE, PsycINFO, ISI Web of Science and Ergonomics Abstracts. We conducted two separate searches. The first search was done to retrieve healthcare papers on interruptions with the term [(communicat* OR interrupt* OR distract*) AND (“human error*” OR “adverse event*” OR “patient safety”) NOT hiv NOT respirat* NOT drug NOT genetic NOT resection NOT traumatic]. The second search was done specifically to retrieve papers on medication dispensing with the term [medication dispensing AND (error* OR “patient safety” OR interrupt* OR distract*)]. Because interruptions are studied under a variety of topics, we conducted the initial search with broad search terms and subsequently reviewed paper titles and abstracts to define the subset for review. Although our main interest is areas other than medication dispensing, where a relation is believed to be reasonably well-established [1], we included medication dispensing to evaluate any growth of evidence since 2002.

After the above search we added further relevant citations from the initial papers, we searched for papers in press, and

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