



# Applying social network analysis to the examination of interruptions in healthcare



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, Australia

<sup>b</sup> Schools of Information Technology and Electrical Engineering, of Psychology, and of Clinical 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 of London, London, United Kingdom

## ARTICLE INFO

### Article history:

Received 12 May 2017

Received in revised form

6 July 2017

Accepted 28 August 2017

### Keywords:

Interruptions

Social network analysis

Sociotechnical systems

## ABSTRACT

Examinations of interruptions in healthcare often focus on a single clinical discipline, and solutions are targeted accordingly. This approach does not take into account the inter-disciplinary dependencies and other sociotechnical aspects that make up the healthcare work system, and suggested solutions may not meet the needs of all stakeholders. In this article a sociotechnical systems perspective is used to uncover the interdependencies between 16 unique work roles that result in interruptions in an intensive care unit (ICU). By applying social network analysis techniques to data collected using the Dual Perspectives Method, we identified targeted systems-based interventions that may reduce unnecessary interruptions while avoiding unintended consequences that impose additional burden on ICU staff. The rich insights gained into the interruptive communication patterns in the ICU work system stand in contrast to findings that would have otherwise been obtained by focusing only on a single clinical discipline or a single perspective.

© 2017 Published by Elsevier Ltd.

## 1. Introduction

Interruptions research has largely focused on protecting the work of a single clinical group, and solutions are targeted accordingly. In a previous review we noted that observational fieldwork is predominantly either nursing- or physician-focused (McCurdie et al., 2016), and very few studies combine observations of more than one role. Commonly, the basis for decisions to intervene are studies that count the rates per hour of interruptions received by a single discipline, where interruptions are categorized by source and/or type (Dante et al., 2016; Duruk, 2015; Kosits and Jones, 2011; McGillis Hall et al., 2010; Redding and Robinson, 2009). Although a single-discipline approach may be informative for a particular group of clinicians, it does not take into account the inter-disciplinary dependencies or other sociotechnical factors that make up the healthcare work system. For this reason, interventions may not always be effective from the perspective of all stakeholders (McCurdie et al., 2017). In this paper we apply a systems approach

to the study and treatment of interruptions in order to identify systems-based interventions that may reduce unnecessary interruptions while at the same time avoiding unintended consequences that may impose additional burden on the ICU work system.

A number of researchers have emphasised the importance of a systems approach in the study and treatment of interruptions in healthcare. For example, Werner and Holden (2015, p. 245) note that “a linear one-task-one-person interruption scenario is rarely the case in health care environments”, but instead that multiple tasks occur in parallel involving multiple entities, all of whom can interrupt and be interrupted. The authors extend their view of interruptions to include the impact of higher-level system factors such as organisational culture and policy on lower-level outcomes such as interruption propensity, based on the macroergonomic view of patient safety presented by Karsh and Brown (2010). Similarly, Weigl et al. (2012) conclude that workflow interruptions can be reduced in healthcare through improved design and consideration of socio-technical aspects such as intra- and inter-professional communication and coordination needs.

Our conjecture is that by analyzing patterns of interaction and interdependencies across *multiple* roles in the intensive care unit

\* Corresponding author. School of Information Technology and Electrical Engineering, The University of Queensland, Brisbane, 4072, Australia.

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

(ICU) we may be able to identify vulnerabilities in the work system and infer whether interventions are truly warranted, and in what form. Critically, we conceptualize interruptions as a sociotechnical systems phenomenon where different “work functions”, enacted by people or intelligent agents, sometimes need to interact in order for the work of the unit to get done. Our challenge has been to find a data analysis method that can capture the complexity in the data collected with the Dual Perspectives Method, and that exposes the above interactions in the most effective way. Previously we introduced the Dual Perspectives Method (McCurdie et al., 2017), which we developed in order to collect data about interactions between work functions. In the present paper we introduce social network analysis to interruptions research as a way of providing quantitative measures and strong visualizations of the interactions between work functions. Together, the Dual Perspectives Method and social network analysis reveal patterns of interruptive interactions between work functions and interdependencies between work roles. Such analyses may help researchers determine where the burden of interruptions falls most heavily in the work system, and whether any interventions are warranted to help people handle demands for their time and attention.

Social networks can be constructed from observations of a work system and the resulting models can inform researchers about how work is actually performed (Houghton et al., 2006). Social network models emphasise both (a) functional entities (roles) and (b) the way in which entities are connected (Stanton et al., 2012). Connections between roles can be defined according to chosen parameters (Stanton et al., 2012), including, for our purposes, interruptive communication patterns. The overall network can then be summarised and analyzed mathematically to reveal underlying properties (Houghton et al., 2006; Stanton et al., 2012) such as routines, patterns of coordination, and hierarchical structure. Houghton et al. (2006) note that although the visual representation of the social network graph alone will sometimes be sufficient for making conclusions, mathematical analysis of the network has three key advantages: “First, it helps us to quantify aspects of the network numerically. Secondly, with large or complex datasets it can be used to mine the network dataset for non-obvious features. Thirdly, it can be used to support or reject the analyst’s intuitive reading of the network graph” (pp. 1205–1206). Social network analysis can contribute to optimisation of the entire work system, rather than parts in isolation (Stanton, 2014), contrary to a single clinical discipline approach.

Unlike conventional observation and quantification methods in interruptions research, the combination of the Dual Perspectives Method and social network analysis goes beyond counts of interruptions to a single discipline to uncover patterns of interruptive communication across multiple work roles observed. The purpose of this paper is to present this combination of methods, as well as to provide an account of observational study findings produced using the methods. In the following sections we provide details of the methods used, followed by a presentation of the results. We then draw conclusions from the resulting data to reveal how a single clinical discipline approach could focus our improvement efforts in the wrong place, and to generate interventions that better fit the intended work system. Finally, we highlight lessons learned and share our recommendations for future research in this area.

## 2. Method

### 2.1. Setting

This research was conducted in a 30-bed Intensive Care Unit at a large tertiary care hospital in Brisbane, Australia. At the time of this study an average of 25 beds were staffed daily. The physical

geography of the unit is arranged according to post-operative (10 beds) and general intensive care needs (20 beds), connected with an adjoining hallway.

### 2.2. Participants

Invitations to participate in the study were sent to staff in most clinical disciplines and across all operational levels of the ICU, including medical staff, nurses in clinical and non-clinical roles, allied health staff in pre-specified professions, and non-clinical support staff, in order to explore the full range of work coordination needs and motivations for interrupting. Forty-six ‘primary’ participants (P1) across 16 unique ICU roles provided written informed consent and were each directly observed for a minimum duration of three hours. The specific roles and number of participants in each role are shown in Table 1. ‘Secondary’ participants (P2) were staff members whose work intersected with the primary participant’s (P1) work in the form of an interruption.

### 2.3. Materials and observation procedure

The Dual Perspectives Method (McCurdie et al., 2017) was used to conduct the observations. To summarise, two observers shadowed each primary participant (P1) for at least three hours. The participant’s activities were recorded using custom data collection notebooks with predefined questions and response categories and an audio recorder. An interruption was defined as a diversion of attention away from the participant’s task, briefly or for an extended amount of time, due to an attention request from an external source (e.g., colleague, phone, device), that may or may not have resulted in switching to a new task. When an interruption occurred, both observers independently recorded the details, including the role of the interrupter (P2), a description of the interruption, and the interrupter’s task that could not be completed without the interruption. Some interruptions meeting pre-specified criteria were followed up in more detail to capture the perspectives of both interrupter (P2) and interruptee (P1) on the reason and need for the interruption, along with their ideas about possible interventions. The interrupter (P2) provided verbal consent if they agreed to answer these questions immediately after the interruption took place. These details helped us to interpret the patterns of communication between roles and reasons for interruptions. Further details about the method can be found in the Appendix.

### 2.4. Social network analysis

Notes and recordings from each observation were transcribed and coded. The average number of interruptions received from colleagues (P2) in the 16 unique roles was calculated on an hourly basis. These data were then used to create an “association matrix”, quantifying relationships between roles formed as a result of interruptions. The association matrix was then used to construct a social network graph “from which one can readily observe structures and relationships.” (Houghton et al., 2006, p. 1205). The social network graph was created using Gephi (v0.9.1), an open-source network visualization platform (Bastian et al., 2009). Gephi was also used to run various statistical analyses on the network data, described in Table 1. These social network metrics are applied to individual roles as well as the overall network as a whole (Stanton et al., 2012) to help to uncover non-obvious features of the network, as well as support or reject conclusions based on the visualizations alone (Houghton et al., 2006). The metrics lead to a better understanding of patterns of interaction across *all* roles in the ICU and make it easier to identify vulnerabilities in the work system. By

Download English Version:

<https://daneshyari.com/en/article/4971902>

Download Persian Version:

<https://daneshyari.com/article/4971902>

[Daneshyari.com](https://daneshyari.com)