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Time matters – A theoretical and empirical examination of the temporal landscape of a hospital pathology service and the impact of e-health

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ABSTRACT

One of the challenges associated with the implementation of e-health systems is the effect they have on the temporal landscape (how time is conceived, structured and monitored) of an organisation particularly as it relates to the way that work is prioritised, allocated, synchronised and coordinated. This study aims to identify the impact of the introduction of a new e-health system on key aspects of the temporal and organisational functioning of a hospital pathology service. The study employed qualitative methods including interviews, focus groups and observation sessions. It was carried out in the period of August 2005 to August 2008 across a hospital pathology service in Sydney, Australia during the introduction of a new laboratory information system and electronic ordering system. The results revealed a number of temporal layers which can be defined as organisational (how the service synchronises its work with other settings); clinical (coordination of work to ensure the appropriate laboratory contribution to effective patient care); procedural (allocating work according to scientific and pathologic processes); and informational and electronic (how and what information is communicated and accessed). The introduction of a new e-health system was shown to have a major impact on the temporal landscape of the pathology service. Specific examples of this were revealed in changes to the way the pathology service: (1) tracked and monitored specimens within the laboratory; and (2) communicated and coordinated its work internally and externally. The use of qualitative methods longitudinally provided key insights into the way that temporal factors operate within pathology laboratories and their interrelationship with the performance, distribution and allocation of work.

Introduction

Electronic health systems (e-health) are often described as an essential part of meeting the challenge of providing safe, effective and efficient health care delivery (Department of Health, 2008). Yet, evidence about their transformative potential and success in delivering major health care benefits remains fragmented and often inconclusive (Car, Black, Anandan, Cresswell, Pagliari, McKinstry et al., 2008; Goldzweig, Towfigh, Maglione, & Shekelle, 2009; Greenhalgh, Potts, Wong, Bark, & Swinglehurst, 2009). For many health service researchers (particularly those within the health informatics discipline) this underlying paradox has triggered a search for a broader understanding of the intractable, multi-dimensional and complex factors that underpin e-health implementation (Greenhalgh et al., 2009; Westbrook, Braithwaite, Georgiou, Ampt, Creswick, Coiera et al., 2007). One of the most challenging features of e-health systems is the effect they have on the *temporal landscape* (ie, how time is conceived, structured and organised) and the impact this may have on the prioritisation, allocation, synchronisation and coordination of work (Adam, 2004; Bardram, 2000; Braithwaite & Westbrook, 2011).

New e-health systems characteristically improve the speed of data transfer and allow higher volumes of data to be exchanged. They also provide greater integration of computing technologies allowing for the linkage and storage of information across multiple sites. These systems are widely acclaimed for their ability to deliver efficiency gains that are often related to the speed and timeliness of information exchange and its effect on organisational output such as laboratory test results (Westbrook, Georgiou, Dimos, & Germanos, 2006), medications (Reckmann, Westbrook, Koh, Lo, & Day, 2009) and radiology results (Mekhjian, Kumar, Kuehn, Bentley, Teater, Thomas et al., 2002). Nevertheless, one of the initial and now widely recognised consequences of electronic

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ordering systems in hospitals, is that entering orders into a computer can take longer than writing them on paper (Tierney, Miller, Overhage, & McDonald, 1993). This can disguise the fact that time savings associated with the new system may only be evident when other activities associated with the ordering process are factored in, for example the time savings associated with the ability of clinicians to place orders and access results from anywhere in the hospital (Shu, Boyle, Spurr, Horsky, Heiman, O'Connor et al., 2001). In a similar way, the capacity of new systems to turnaround results faster to clinicians does not automatically result in better patient care down the track. This was highlighted by a 2001 UK study of ward computers undertaken by Kilpatrick and Holding which showed that a major proportion of urgent biochemistry test results (45% for accident and emergency and 29% for inpatient wards) were never accessed (Kilpatrick & Holding, 2001). Clearly the issue of timeliness and efficiency needs to be considered across a broader temporal framework.

A key and recurring feature of new e-health technologies is their ability to alter the meaning of tasks and work activities and introduce new practices and ways of doing things. This is a point emphasised by Wajcman, who suggested that it is wrong to view new technologies as simply a means of doing the same things as previously, only faster (Wajcman, 2008). A recent study of the impact of an electronic ordering system in an Emergency Department in Australia revealed shifts in the way that work was carried out, as well as changed areas of responsibility and unintended consequences (Fernando, Georgiou, Holdgate, & Westbrook, 2009). In 2005, Han et al. reported an unexpected increase in mortality after the implementation of an electronic ordering system in a US children's hospital. The study described increased time constraints, changes in the organisation of bedside care and the diminution of opportunities for face-to-face clinical communication (Han et al., 2005). Organisations are constantly searching for ways to organise their time because of the impact it has on how their work is undertaken. This remains an important, but too often neglected area of concern that can affect the uptake and functioning of new systems. The aim of this study was to identify the impact of the introduction of a new e-health system on key aspects of the temporal and organisational functioning of a hospital pathology service.

Theoretical considerations

Health care performance is significantly influenced by temporal and spatial factors. According to Zerubavel's seminal study on the patterns of time in hospital life, this includes sequences, durations, locations and rates of recurrence (Zerubavel, 1979). Within this framework, time can be viewed either as an objective entity (the metaphoric clock) which is mechanical, linear and quantitative (Orlikowski & Yates, 2002) or as a subjective conceptualisation which is qualitative, discontinuous and cannot be presented in neat, easy-to-measure and synchronised formats (Hesse, Werner, & Altman, 1988).

In addition, mobility is increasingly depicted as a crucial facet in the delivery of quality health care. Clinical work is required to be undertaken in multiple locations while simultaneously ensuring the optimum collaboration and communication between health care practitioners (Ammenwerth, Buchauer, Bludau, & Haux, 2000). E-health technologies can have a fundamental effect on the temporal flow and organisation of activities leading to changes in the way that health care professionals understand their tasks, roles and relationships (Barley, 1988). New technologies can also give rise to apprehension about the acceleration and pace of activity leading to concern that they may be generating data overload and leading to temporal disorganisation because of their propensity to encourage "juggling" and multi-tasking of activities (van der Sijs, Aarts, Vulto, & Berg, 2006).

In the wider community, computing systems and devices are associated with new and emerging social practices (eg, networking) which are dramatically changing the way people organise their temporal space (Wajcman, 2008). In health care however, the evidence of the impact of technology has tended to focus on their administrative, documentation and decision support capacity, and less on any thorough assessment of its impact on work practices, the temporal landscape, spatial considerations and mobility (Prgomet, Georgiou, & Westbrook, 2009), ie, technology's ability to achieve the right configuration of people, resources, knowledge and place (Bardram, 2005).

The concept of "time-space distanciation" is also relevant to the subject of the impact of e-health systems. In the past space and place largely coincided, ie, you were in the same place as the person with whom you needed to communicate. But new technology has fostered relations between people without face-to-face interaction (Giddens, 1990). The concept of distanciation is best exemplified by the growth of asynchronous e-health communication systems where messages can substitute for previous face-to-face communication. Distanciation also brings with it a new set of organisational challenges arising from changes in clinical responsibilities and work processes (Jin & Robey, 2008). These perspectives have been chosen to contextualise the study and to help comprehend the impact that e-health systems have on the way that work is organised within its temporal landscape.

Material and methods

Research setting

This research was carried out in a pathology service employing over 300 staff located at a major metropolitan tertiary referral hospital in Sydney, Australia. The service involves a network comprising seven major hospitals covering some 6500 square kilometres with an estimated population of 1.33 million, representing some 20% of the population of the state of New South Wales. The pathology service includes specialised departments containing teams of professional pathologists, laboratory scientists, technicians, computer staff, along with blood collectors, specimen reception staff, couriers and administration staff (Australian Institute of Medical Scientists, 2010).

The study was carried out across five pathology departments (Clinical Chemistry, Haematology, Central Specimen Reception, Microbiology and the Blood Bank) during the period August 2005 to August 2008. In November 2005 these departments were scheduled to have their laboratory information system replaced by the Cerner Corporation's (Kansas City, USA) Pathnet system which automates clinical and managerial pathology data processes. In January 2006 this system was integrated into a new hospital-wide Computerised Provider Order Entry (CPOE) system called PowerChart (version 2004.01) which replaced hand-written paper requests for pathology and other services. The system allows clinicians to place orders directly into computers that are in turn linked to a broad spectrum of clinical information databases. The inclusion of decision support features (eg, alerts, error prevention prompts and guideline access) provides valuable tools to assist the patient care process. The implementation represented one of the first steps in a large-scale health IT strategy that aimed to introduce electronic ordering in hospitals across New South Wales using mandated systems implemented by a regionally-based information service departments working in collaboration with a wide spectrum of hospital departments (Clinical Systems Strategy Unit,