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Ergonomics and infection outbreaks

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For most of us in the UK the last few months have been dominated by Government and media reports about the Swine Flu pandemic. Many people will have thought over the consequences of a mass outbreak, particularly those of us with young children or elderly relatives. Not that long ago the subject of hospital-based infections such as *Clostridium difficile* and MRSA was the focus of huge amounts of attention from the newspapers and television.

At first sight infection outbreaks might be thought of purely as a medical or microbiological matter and not a subject to interest ergonomists. In reality quite a lot of recent work, particularly within the domain of systems ergonomics, has sought to explain the underlying factors leading up to infection outbreaks. The aim of this short article is to describe some work focusing on a specific hospital-based infection outbreak which occurred at the Maidstone and Tunbridge Wells NHS Trust between 2005 and 2007. A second aim is to demonstrate the value of using a systems ergonomics approach in order to analyse infection outbreaks and help prevent their occurrence.

The outbreaks which occurred within the Maidstone and Tunbridge Wells Trust represent the combined impact of a complex set of factors extending over several years. In common with most examples of accidents, disasters or large-scale adverse events, the outbreaks are best interpreted as arising through the combination of a number of interrelated systemic factors and influences.

At the very highest level of the system, Government-set targets placed many individuals, particularly those at Trust board and management levels under a great deal of pressure. This pressure in itself may have led them to make poor decisions, and in some cases to prioritise bed occupancy rates at the expense of the risk of an infection outbreak. Within the Trust it is likely that targets exerted considerable pressure on the system as a whole and this pressure filtered down various levels of the system. It is possible that the drive to comply with these targets increased the likelihood of an adverse event taking place at some stage. Poor

communication, confusion of responsibilities and accountabilities between and within the various regulatory bodies delayed the time in which they could react to the outbreaks. A 2008 report by the Healthcare Commission examined the underlying causes of serious failures in NHS healthcare providers and identified large-scale organisational processes such as mergers and poor change management procedures as common factors.

Within the hospital the actions of senior managers were identified as significantly contributing to the failure to prevent and deal with the outbreaks. The link between management, human resource management (HRM) practices and work performance outcomes has been investigated in detail in the last few years. Evidence-based reviews suggest that there is a link between high-involvement HRM practices and employee productivity. High involvement HRM practices typically include empowering employees to make their own decisions and the presence of self-managed teams. These types of practices in organisations have also been shown to increase levels of employee productivity. Similar effects have been shown between HRM practices and measurements of safety outcomes (e.g. number of adverse events).

Aside from the way in which senior managers behaved at the Trust, the question still remains as to why they ignored, or at least failed to realise, the seriousness of the outbreaks and their consequences. Many of the managers interviewed in the original Healthcare Commission report on the outbreaks reported that they were aware of how serious the situation had become within the Trust, but were powerless to do anything about it. One possible explanation is what Diane Vaughan in her highly influential study of the Challenger shuttle disaster termed the 'normalisation of deviance', namely that managers over time began to accept and take for granted the level of infection risk within the Trust. Only after the level of risk built up to a point where it could not be controlled, did they begin to realise the gravity of the situation.

Understaffing and general lack of resources

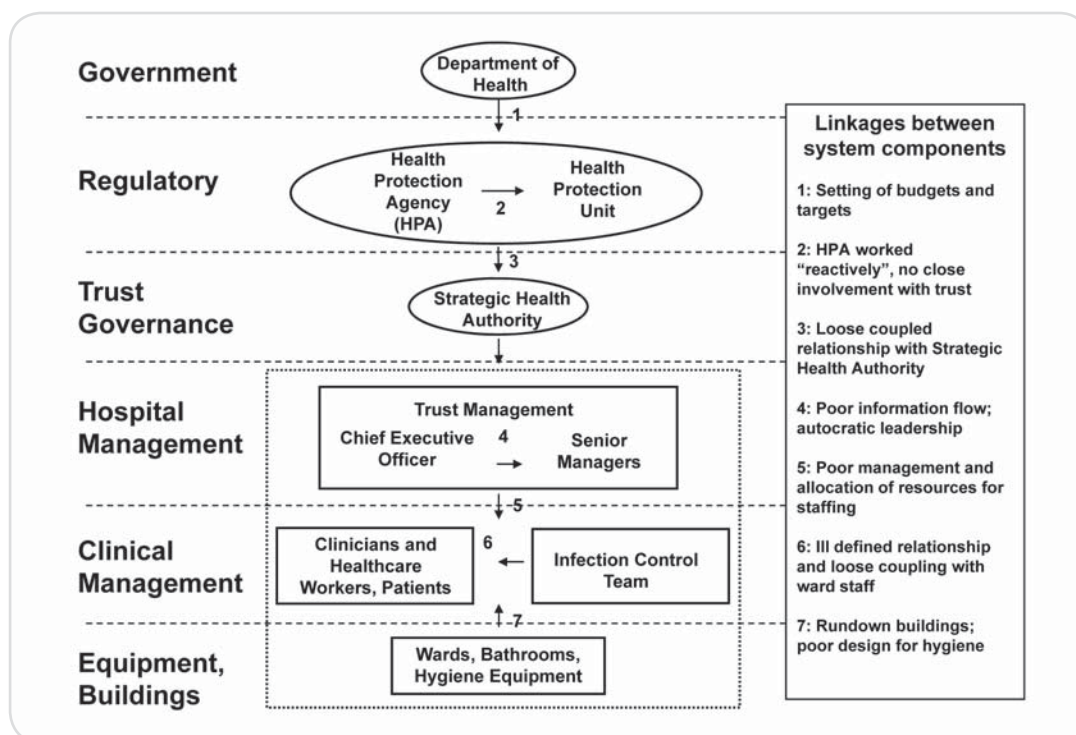
together played a part in the outbreaks. Staffing ratios and levels of staff morale almost certainly contributed to the problem of containing the spread of infection on the wards. In general, the research literature provides some evidence that lower levels of staffing increase the likelihood of infections occurring. For example, researchers have found an inverse relationship between staff downsizing and the rate of hospital-based infection. Curiously, little research has been conducted on the impact of job satisfaction/morale on hospital infection levels. However, findings from other domains (e.g. manufacturing and service industries) suggests that lower levels of satisfaction are clearly linked to lower levels of job performance.

Finally, it might be conjectured that the behaviour of clinicians and other health care professionals within the Trust shares similarities with those of senior managers and Trust board managers. Many individuals at ward level were aware of the poor hygiene and inadequate patient monitoring practices but saw no way to improve the situation. Karl Weick and Kathleen Sutcliffe analysed data from the Bristol Royal Infirmary Report and concluded that hospital staff became locked into particular lines of action or behaviour where they “search for confirmation that they are doing what they should be doing”. These so-called ‘cultures of entrapment’ inhibit an organisation’s ability to break out of patterns

of behaviour that, over time, can lead to adverse outcomes.

Many of the issues that have been described in this article have not been researched in much depth within infection control, particularly organisational and managerial behaviour. Most research, alongside interventions designed to improve infection control and limit outbreaks, has focused on individual levels of analysis (e.g. hand hygiene). As a result we are currently in danger of only seeing one part a much larger picture. Adopting a systems approach is one step towards filling in the missing details, particularly as they relate to causal relationships that may exist between system levels such as the interaction between management styles, aspects of hospital design and individual behaviour (e.g. hand washing), and outcomes (e.g. infection rates).

Preventing and minimising the risk of infection outbreaks is likely to be a huge challenge for the future. In order to meet this challenge ergonomists will need to work alongside healthcare professionals and managers, organisational psychologists and other groups e.g. hospital architects, microbiologists and infection control experts. Much remains to be done. However, adopting a systems perspective represents a promising way of mapping out areas worthy of further investigation, as well as scoping the nature of interventions designed to prevent the spread of infections. ❖



This article is based on Waterson, 2009, A systems ergonomics analysis of the Maidstone and Tunbridge Wells infection outbreaks. *Ergonomics*, 52, 10, 1196-1205 and Waterson (in press), Infection outbreaks in acute hospitals: A systems approach. *Journal of Infection Prevention*.