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Integrating systemic accident analysis into patient safety incident investigation practices

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ABSTRACT

There is growing awareness of the limitations of current practice regarding the investigation of patient safety incidents, including a reliance on Root Cause Analysis (RCA) and a lack of safety expertise. Human Factors and Ergonomics (HFE) can offer safety expertise and systemic approaches to incident analysis. However, HFE is underutilised in healthcare. This study aims to explore the integration of HFE systemic accident analysis into current practice. The study compares the processes and outputs of a current practice RCA-based incident analysis and a Systems Theoretic Accident Modelling and Processes (STAMP) analysis on the same medication error incident. The STAMP analysis was undertaken by two HFE researchers with the participation of twenty-one healthcare stakeholders. The STAMP-based approach guided healthcare stakeholders towards consideration of system design issues and remedial actions, going beyond the individual–based remedial actions proposed by the RCA. The study offers insights into how HFE can be integrated into current practice.

1. Introduction

High risk industries such as aviation, nuclear, rail and healthcare use accident and incident investigation to learn from failure and create action plans to avoid future incidents (Salmon et al., 2011). Within healthcare there is growing awareness of issues with current practice in incident investigation, with questionable quality of investigations and analysis resulting in ineffective recommendations and action plans (Wu et al., 2008; Peerally et al., 2016; Kellogg et al., 2016). Limitations identified include an over reliance on the promotion of a single flawed reductionist approach, Root Cause Analysis (RCA) and a lack of utilisation of external safety expertise (Wu et al., 2008; Peerally et al., 2016; Kellogg et al., 2016). Human Factors and Ergonomics (HFE) has developed expertise in systems safety and applied various systemic approaches to incident analysis. HFE's systemic accident analysis and system design approaches have been developed for use in complex work systems (Leveson, 2012; Hollnagel, 2012; Rasmussen, 1997) and are judged to be better suited to forming an understanding of accidents in complex high-risk industries, as compared to traditional causal event chain techniques, such as Root Cause Analysis (Salmon et al., 2011; Leveson, 2004; Hollnagel, 2004).

The potential of systemic accident analysis in healthcare such as Systems-Theoretic Accident Model and Processes (STAMP) (Leveson, 2004), AcciMap (Rasmussen and Svedung, 2000) and Functional Resonance Analysis Method (FRAM) (Hollnagel, 2012) has been demonstrated through analysis undertaken by experienced external method experts (e.g. Leveson et al., 2016; Karsh et al., 2014; Alm and Woltjer, 2010). However, systemic accident analysis has had little exposure to healthcare stakeholders that undertake incident investigations in current healthcare practice. A potential avenue for HFE to have a beneficial impact on healthcare is by facilitating healthcare stakeholders to apply systems approaches to their incident investigation (Waterson and Catchpole, 2016).

The current study aims to investigate the application of an HFE-led systems approach to healthcare incident analysis. Taking into account the time constraints of healthcare stakeholders the study asks how collaboration between HFE and healthcare can facilitate system thinking and guide analysis towards recommendations of more effective remedial actions.

2. Methods

2.1. Setting

The study is centred on a medication error incident (an insulin overdose case from a prescription error) involving two healthcare providers in the UK serving a population of around one million; an acute trust employing over 14,000 staff with a 900-bed hospital and a

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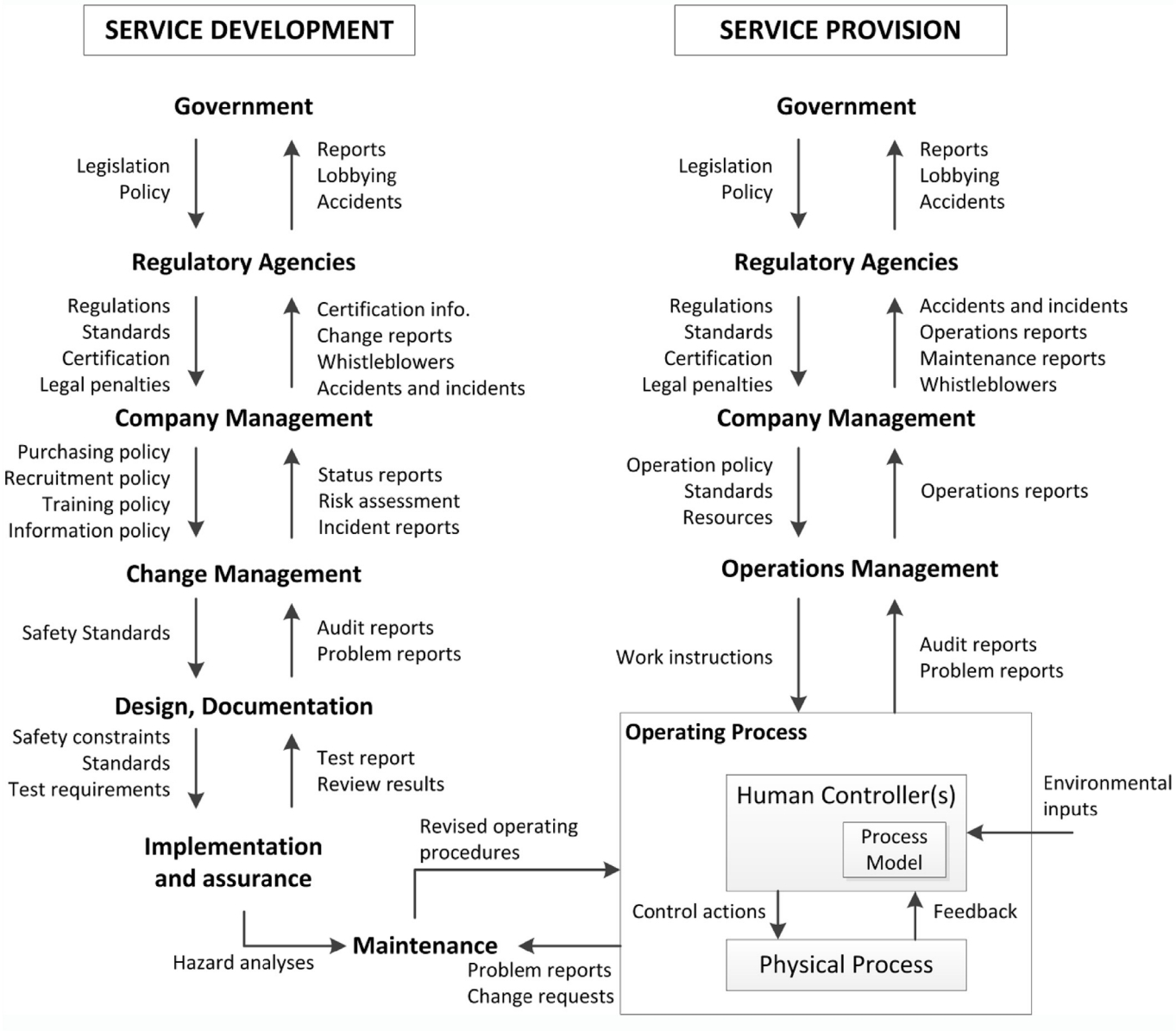

Fig. 1. Generic safety control structure for hospital. Adapted from Leveson (2004.

trust providing community health services which employs over 5000 staff. The incident involved a patient being administered an overdose of insulin on three occasions following a drug prescription error. Drug prescription errors have previously been identified as the most common type of medication error (Leape et al., 1995; Bates et al., 1995) and in the UK, it is believed that up to 1.5% of hospital prescriptions may contain a medication error (Dean et al., 2002).

The events leading up to the incident can be summarised as: A patient was admitted to a hospital emergency department following a fall at home and subsequently transferred between wards. After being found to have high blood glucose level a review by a diabetes specialist nurse (DSN) suggested the patient to start insulin glargine U100 10 units once per day. The recommended dosage was misread by the prescribing doctor and 100 units were prescribed instead of 10 units. The high dosage was administered twice at one provider ward and then following discharge to another provider ward, a further time before the error was identified by an advanced nurse practitioner.

2.2. Incident analysis: current practice

Prior to this study, a formal investigation of this incident was undertaken through Root Cause Analysis by a team of healthcare professionals following the National Patient Safety Agency (NPSA) level one investigation profile (NPSA, 2008): Level one is a most commonly used concise investigation for incidents that resulted in no, low or moderate harm to the patient. This investigation team included an investigation chair, 2 team leads and 7 team members. Information gathered by this team included interviews with key staff involved in the incident, statements from nursing and medical staff involved in the incident, a review of an incident report form, review of medical and nursing records, and review of procedures and protocols. The report from this investigation was subsequently used as the initial basis for the systemic accident analysis and the results from both analyses were compared.

2.3. Systemic accident analysis

Based on the RCA-based investigation report, a systemic accident analysis approach using Systems Theoretic Accident Modelling and

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