Using Systems Thinking to Identify Risks in Telephone Triage: MEAD Study Findings

Jill Poots^{1,2}, Jim Morgan¹, Matteo Curcuruto¹, Stephen Elliott², & Andrew Catto²

¹Leeds Beckett University, United Kingdom ² Integrated Care 24 (IC24), United Kingdom

SUMMARY

This paper presents findings from a modified Macroergonomic Analysis and Design (MEAD) study aiming to identify system components and risks in a telephone triage system. Themes identified included: 'accessibility and availability'; 'risks on the part of the telephone triage professional'; 'risks posed by callers'; and 'barriers to safety incidents'.

KEYWORDS

Telephone triage, primary care, macroergonomics

Introduction

Telephone triage use is rising, due to its convenience, advantages for disease control, and high patient satisfaction. Whilst considered to be predominantly safe, telephone triage services have been implicated in harm to, and death of, patients (Rees et al., 2017). Despite these concerns, there has been little attempt to study telephone triage work through a human factors lens, to improve patient safety. To address this research gap, this study used a modified Macroergonomic Analysis and Design (MEAD) approach (Murphy et al., 2018) to identify system components, their interactions and contributions to risk in a telephone triage system. A secondary aim was to assess the suitability of the MEAD framework for exploring factors affecting safety in complex sociotechnical systems.

Methods

Murphy et al.'s modified MEAD framework was used to understand system components, their interactions and subsequent risks for patients, via the following steps: initial system scan; key informant interviews (n = 25) using the critical incident technique (CIT); analysis using mapping; and validation of findings. To understand interacting components, while mitigating researcher bias, Leximancer software was used to analyse interview findings. These findings were then validated through reflexive thematic analysis. To visualise deviations from intended system use and design (i.e. variances), and depict interactions between system components, a variance matrix (Kleiner, 2002) was also constructed. Variances were developed by comparing document scans and interview findings, before being presented to subject matter experts, with the aim of validating findings and ascertaining future research priorities.

Results

System Mapping

The system map was developed iteratively using document scans, discussions with subject matter experts, and interview findings, and subsequently illustrated using LucidChart. It revealed there are a number of 'work systems' encountered in any one triage call, many of which involve increased

patient-professional collaboration and human-computer interaction. For example, at several points of the system, communication between a patient and professional is mediated by technology.

Leximancer analysis

Leximancer indicated '*time*' as one of the most salient risk factors, across various points of the system (for example, lengthy delays accessing the service, or receiving clinical advice from colleagues). Concepts relating to the external environment such as '*ambulance*' and '*COVID*' were also frequently mentioned, suggesting the telephone triage service does not operate in isolation, but relies on other parts of the health system to work well. Technology-related concepts highlighted the important role of computer decision support systems in mediating communication between patients and professionals.

Validation and construction of the variance matrix

Secondary analyses revealed similar trends to Leximancer, and yielded different data extracts, extending and validating the findings. Perceived risks according to advisors resulted in themes such as: *'risks on the part of the telephone triage professional'*, *'risks posed by callers'*, *'risks due to accessibility and availability'* and *'barriers to safety incidents'*. For example, *'time'* was again mentioned, with respect to the potential for patients' health to deteriorate if they have to wait at multiple points in the system. Variances identified included conflict between roles due to key performance indicators, and an under-appreciation of the role of patients in their care. These were validated using recent focus group with sixteen representatives from within the organisation using a Likert-scale. Agreement was high for all proposed variances, risks and the proposed system map.

Discussion

MEAD proved a useful framework for mapping the system and identifying risks and variances in a service not previously investigated using human factors tools. It positioned this telephone triage system within the context of the external environment, suggesting availability and public health issues may impact the likelihood of safety incidents in telephone triage systems. Risks unique to telephone triage were outlined, such as the role of the patient in reporting their symptoms accurately. It is anticipated the validation of the variance matrix will be useful in identifying research priorities and serve as a foundation for more specific human factors research. Although participants were recruited from multiple contact centres and levels of the host organisation, it would be useful to extend this research to other providers of telephone triage including for-profit enterprises and GP surgeries. A future modified Delphi study aiming to identify contributory factors specific to telephone triage systems will include experts from a broader sample of organisations.

References

- Kleiner, B. M. (2002). Macroergonomic Analysis and Design (MEAD) of Work System Processes. Human Factors and Ergonomics Society 46th Annual Meeting,
- Murphy, L. A., Robertson, M. M., Huang, Y.-h., Jeffries, S., & Dainoff, M. J. (2018). A sociotechnical systems approach to enhance safety climate in the trucking industry: Development of a methodology. *Applied ergonomics, 66*, 82-88.
- Rees, P., Edwards, A., Powell, C., Hibbert, P., Williams, H., Makeham, M., Carter, B., Luff, D., Parry, G., Avery, A., Sheikh, A., Donaldson, L., & Carson-Stevens, A. (2017, Jan). Patient Safety Incidents Involving Sick Children in Primary Care in England and Wales: A Mixed Methods Analysis. *PLoS Med*, 14(1), e1002217. https://doi.org/10.1371/journal.pmed.1002217