

Evaluating compartmentalised coloured-coded trays for the organisation of anaesthetic syringes

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SUMMARY

This paper provides an overview of a project evaluating compartmentalised coloured-coded trays for organising and storing anaesthetic syringes. Interviews with consultant anaesthetists and an online error detection experiment to test the trays under secondary cognitive load were conducted. Findings indicated workspace organisation issues in theatre, and that the use of colour-coded compartmentalised trays could help organise the theatre workspace, enhance visual search and mitigate cognitive load.

KEYWORDS

Anaesthesia, Cognitive load, Visual Search, Drug preparation, Patient safety

Introduction

Anaesthesia in theatre is a complex task which entails significant possibility of error. There is growing recognition of errors in anaesthesia and a range of preventative measures are being implemented, but errors are still occurring (Maximous et al., 2021). Anaesthetists are often solely responsible for the selection, preparation, and administrations of anaesthetic drugs (McClelland et al., 2017) and there is currently no standardised practice in place for storing or organising drugs during procedures. Drug ampoules are often placed together within the workspace or in a single non-compartmentalised tray (Almghairbi et al., 2018), with substantial variability in practice. Research has been considerable, with increasing acknowledgement of the importance of examining the effect of human factors on safety and effectiveness throughout the anaesthetic process (Phipps et al., 2011).

UVAMED's compartmentalised coloured-coded Rainbow Trays for the organisation and storage of anaesthetic syringes are designed to store and organise syringes during anaesthetic procedures. They correspond to the ISO26825:2008 colour coded system for drug labels. Almghairbi et al. (2018) found that rainbow trays were perceived as easy to use and helped the identification and separation of drugs. These were contrasted with one colour, single compartment paper mulch trays, as a potential source of errors such as syringe swaps. The present project used interview methods and an online experiment to examine the effectiveness of colour coded compartmentalised trays in organising syringes and simplifying the visual search process.

Study 1

Semi-structured interviews with four senior consultant anaesthetists and one retired senior consultant anaesthetist explored the anaesthetic administration process to explore the relevance of an existing

task analysis (Phipps et al., 2008). The role of colour coded-compartmented trays in anaesthetic practice was also explored. The study identified issues with standardisation and organisation in current practice, with different methods for storing, transporting, and administering anaesthetic drugs. Therefore, introducing a colour-coded compartmentalised trays could be a useful standardisation and provide an additional layer of safety by facilitating syringe checks.

Study 2

Fifty-three participants with experience of working in operating theatres (32 anaesthetists and six trainee anaesthetists, four Operating Department Practitioners and 11 Operating Department Practitioner apprentices) completed an error detection task under cognitive load, where participants were presented with either a loaded colour-coded compartmented tray or a loaded paper mulch tray (standard tray). Cognitive load was manipulated through a secondary visual spatial working memory load task. Colour-coded compartmented trays elicited more accurate responses than standard trays (87.1%, SD = 37.6% vs 82.5%, SD = 38.6% respectively, $p = .006$). Participants were also slower in correctly ruling out errors on the error-absent trials for standard trays (17.37s, SD = 7.76 vs 18.65s, SD = 9.17, colour-coded vs standard respectively, $p = .011$).

Discussion

Findings highlight the lack of standardisation in workspace organisation in theatre as a potential source of error. Using colour coded compartmentalised syringe trays may mitigate some routes to error. For the online study, improved error detection times and checking times for errors for colour-coded compartmented trays were indicative of reduced cognitive load and an enhanced visual search process compared to paper mulch trays trials. Such effects of cognitive load are an increasing focus of interest in theatres. To expand, the distracting and stressful environment serves to occupy the mental effort of theatre professionals and steps to mitigate this can benefit the primary tasks that are being completed, as well as freeing up germane cognitive load for the development of more efficient strategies or task monitoring. Findings indicated that colour coded compartmentalised trays are a promising safety measure. Further evidence from usage in theatre settings rather than virtual settings would bolster this view.

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