FRAM: A boundary object to understand management of paediatric leukaemia patients

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SUMMARY

This paper describes the use of the Functional Resonance Analysis Method (FRAM) to understand the potential for variability in the delivery of chemotherapy across distributed care providers. The complexity of the system is considered and how the use of a FRAM model enabled cross disciplinary collaboration. This enabled consideration to common scenarios and incidents, where variability in the delivery of care is critical to adapt to a patient's condition. The use of scenarios and incident-based analysis revealed how core functions within the system influenced the ability of teams and families to effectively monitor and communicate treatment regimes. In using the FRAM model to facilitate discussions, the team were able to challenge their beliefs on how knowledge of treatment regimens and a shared understanding across geographically distributed sites was achieved. This created new and shared knowledge on the potential variability in communication and transfer of information, essential to the reliability of the delivery of chemotherapy as intended. The paper considers the value and role of the FRAM model as a boundary object, an artefact that can support staff with different roles within the team to engage equally to solve a problem or safety concern.

KEYWORDS

Healthcare, paediatrics

Introduction

Children with leukaemia who live outside regions offering specialist cancer services benefit from a shared care system involving multiple healthcare providers, allowing for more accessible care closer to home while drawing on the expertise of regional tertiary care. However, this model of distributed care increases the complexity of the system. There is a dependency upon families to become highly knowledgeable of drug combinations and information to be accurately delivered to enable distributed cognition across clinical professionals. The risks associated with managing chemotherapy, include potential medication incidents such as missed or excessive doses, and complicated or miscommunication of care adjustments between multiple providers and families.

This paper describes work to analyse potential variability using the Functional Resonance Analysis Method (FRAM) (Hollnagel, 2012) to consider various patient safety scenarios and incidents in the delivery of chemotherapy. The work described in this paper was completed to identify opportunities to enhance resilience of the core functions relied upon for the reliability of chemotherapy treatment provided across different providers. This was achieved through team-based and organisational learning undertaken at a large acute children's hospital.

Method

The Functional Resonance Analysis Method (FRAM) was used to examine chemotherapy provision in a paediatric haematology and oncology service in the South West region of England. The investigation plan involved a qualitative data collection approach (McGill et al., 2023). Information was gathered through a document review of organisational data, such as standard operating procedures and clinical guidelines, to extract initial functions and characterise aspects. As this was used to inform a patient safety incident investigation, an ethnographic approach was adopted, involving observations of clinical processes to understand multidisciplinary team (MDT) meetings as well as the work environment to gain a deeper understanding of context and work-as-done. Semi-structured interviews were conducted with 11 multidisciplinary team members, covering 660 minutes, to understand how everyday work is performed. Parents were also interviewed for a total of 270 minutes which assisted in validating information provided by the clinical team members, to extract further functions and elaborate on aspects involving families. The interview questions focused on how chemotherapy regimens were communicated, recorded, and adjusted, as well as challenges in maintaining continuity of care.

Qualitative data analysis was thematically conducted using an inductive approach, drawing from interviews, observations, and organisational data (Braun & Clarke, 2022, pp. 55–56). This primarily followed a semantic analysis, as coding was based on explicit descriptions of work-as-done; however, some latent elements were incorporated, drawing on contextual understanding to extract and define the aspects within each FRAM function. The analysis informed how intended variabilities were essential to adapt to the patient's presentation and where less intended variability may occur. Functions were extracted from the data, and a FRAM model was developed to explore the couplings, dependencies, and variability across these functions. Two workshops, totalling five hours, were conducted with key stakeholders, including clinical representatives, to review and refine the model.

The FRAM Model Visualiser was used to design the model. Functions were colour-coded as follows: blue for Principal Treatment Centre functions, green for handover to parent or shared care unit functions, yellow for parent/caregiver functions, and orange for new functions added during the workshop.

Results

Preliminary findings revealed the complexity in paediatric care, involving multiple stakeholders across different locations, with technology playing a key role in communication and support for distributed cognition to ensure safety of the delivery of care. The electronic system for prescribing and administering chemotherapy was inadequate to reliably alert staff to incorrect or incomplete actions during safety-critical tasks. Parents and guardians were recognised as providing the resilience in the system, as they adapted to gaps in knowledge across teams exacerbated by a lack of interoperable electronic patient record systems and shared critical information between geographically distributed units. They were required to understand their child's chemotherapy regimen in considerable detail to collect and reconcile medications, but the lack of a user-friendly treatment schedule hindered their understanding and the coordination between families, staff, and care sites. Allocation of staff rosters had the potential to disrupt care continuity, with a trade-off required between extended shift duration and increased frequency to achieve continuity. This highlighted the absence of organisational fatigue management to support the reliability and effectiveness of the delivery of chemotherapy treatment. The review of the FRAM-built model also highlighted to the team a high dependency on one particular critical function (e.g., allocating chemotherapy at the Principal Treatment Centre prior to prescribing chemotherapy) not fully recognised prior to the workshops. This informed the team on the improvements they agreed to test, which were intended to enhance the ease, reliability and visibility in modifications of treatment regimes between clinicians and across clinical sites.

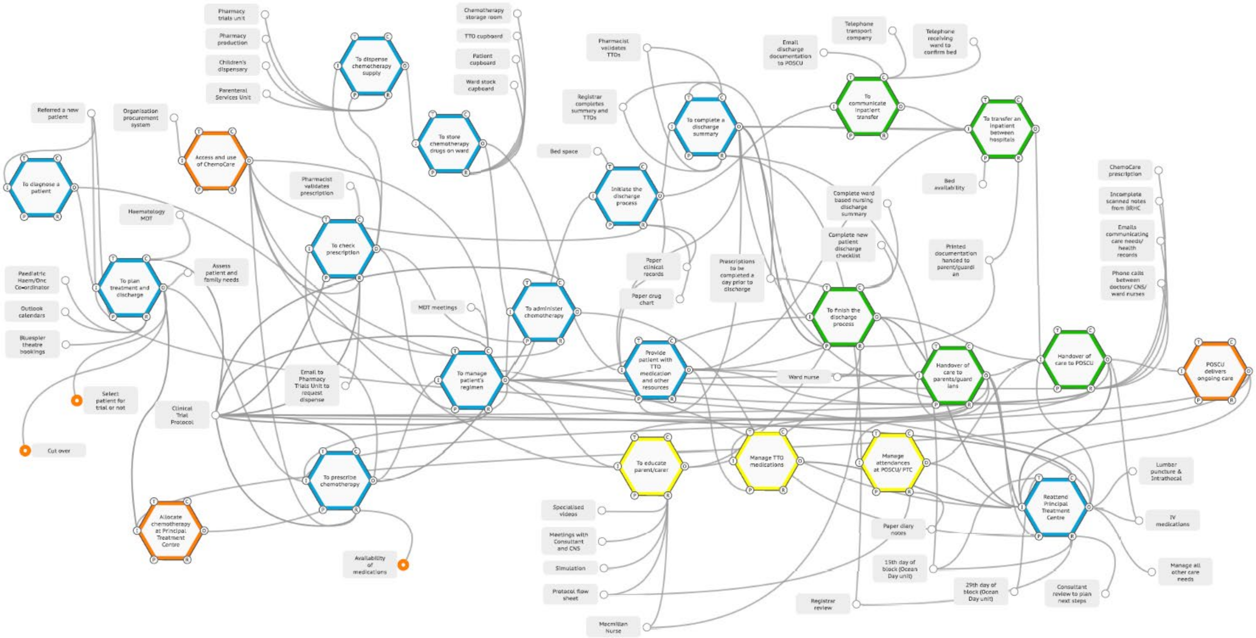

Figure 1: FRAM model of treatment regimes

Discussion

FRAM effectively visualised the complexity in the need for the system to accommodate adjustments to treatment regimes and ensure distributed cognition across the chemotherapy care system. The approach highlighted key functions and constraints shaped by geographical and technical factors. It raised important questions about safety oversight, in managing dose adjustments across locations and improving visibility in a distributed care network.

Traditional techniques used in healthcare are designed to understand how control has been lacking in the system when things go wrong (e.g., Larouzee & Le Coze, 2020). However, FRAM seeks to understand conditions of performance variability and how resilience can be built into the system (e.g., Sujan, 2021; Sujan et al., 2023). FRAM offered a 'blank model' for clinicians to visualise a systems view of clinical scenarios and incidents. This approach facilitated validation of the model and identified additional functions, which contributed to the variability in the delivery of care and required focus to enhance system resilience to accommodate these known variabilities. The process benefitted from a highly engaged clinical team and informed safety recommendations to enhance resilience locally and regionally.

The authors propose that the FRAM-built model acted as a boundary object, defined as '… a shareable and tangible artefact around which group members can interact about a problem situation of concern…' (Star and Griesemer, 1989). The workshop provided new insights to how and why the system usually succeeds but why unintended outcomes occur. The presentation of system complexity provided a shared framework that aided meaning-making between system investigators and clinical staff (Nathues et al, 2024). Using models as boundary objects is recognised as supporting the development of new knowledge through a collaborative approach to problem solving (Franco, 2019). The FRAM model from this work will be used to openly explore incidents and proactively simulate future scenarios and system changes, supporting further interventions. The limitations of this work and future consideration will be given to how families can contribute to system reviews.

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