The Out-of-Hours Review: From Work Systems Analysis to Recommendations and Beyond

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SUMMARY

Empirical evidence on the contribution of Human Factors and Ergonomics to healthcare system redesign is limited. Although the Out-of-Hours Review began with an initial limited work systems analysis, this project has since developed and progressed through three of the four major phases of healthcare system redesign, namely analysis, design, and implementation. This paper will describe elements for each of these phases and the contribution of the Human Factors team and how qualitative data captured throughout this collaboration shows indications of the changes to the work system since the initial systems analysis conducted in 2021/2022.

KEYWORDS

Healthcare, Systems analysis, Recommendation implementation

Introduction

The dual aims of Human Factors and Ergonomics (HFE) is to optimise human wellbeing and system efficiency by understanding the interactions between work system elements (IEA, n.d.). This is achieved through avoiding a reductionist approach and developing recommendations for system design or redesign (Czaja & Nair, 2012). System design, and similarly redesign, is a complex activity and can be slow to implement (Czaja & Nair, 2012), particularly for healthcare systems. Due to their inherent characteristics, healthcare systems are complex sociotechnical systems (Braithwaite et al., 2013), with many in need of redesign, to improve both patient safety and system efficiency (Xie & Carayon, 2015).

Although HFE is receiving increasing acknowledgement of the potential it has to offer healthcare systems (Perry et al., 2021), empirical evidence on its contribution to healthcare system redesign is limited (Carayon et al., 2014). Furthermore, conducting a systems analysis, the usual starting point, does not address the question of how to implement work system redesign and recommendations (Xie & Carayon, 2015). The four major phases of healthcare system redesign include analysis, design, implementation and evaluation (Carayon, 2010). This paper will describe an example of the application of HFE to three of these phases, namely the preliminary work systems analysis, design of the recommendations and the work-to-date on implementing these for the service that provides out-of-hours (OOH) care at one large NHS Hospital Trust.

Work Systems Analysis from the OOH Review

Between August 2021 and May 2022, a comprehensive work system analysis of the Hospital24 (H24) service at a large NHS Trust was undertaken to capture the current state of this service to determine the future potential staffing and work system requirements. At the time of the review, this

service provided the care of all adult inpatients, except for Maternity and Critical Care, between 17:00 and 09:00 on weekdays, as well as all hours on weekends and Bank Holidays. More recently the service has extended to provide additional support to the wider hospital during the in-hour periods. To provide this care, this service has a unique work system structure consisting of a small, dispersed team with essential communication occurring through an online task management system, which is inherently different from the more traditional daytime services and ward structures (Carman et al., 2022).

This service review, named the Out-of-Hours (OOH) review, consisted of three workstreams, namely Human Factors (HF), Capacity-Demand and Benchmarking. The HF workstream aimed to describe the work system and identify work system barriers that prevent it from operating effectively. The Capacity-Demand workstream aimed to quantify, where appropriate, task data, determine "demand hotspots" and develop a task-load prediction model. The Benchmarking workstream, using survey data, aimed to determine the structure and operation of OOH services in other Trusts in the UK. This unique work system structure and additional results from the initial work systems analysis have been described in more detail in an earlier paper (i.e. Carman et al., 2022). A brief summary of the barriers and facilitators identified from across all three workstreams of the review have been included below. The key types of barriers identified were associated with the following:

- Data sufficiency and quality – for example, the task management system under-represented the number of tasks completed by the service.
- Staffing and workload – for example, staff highlighted staff shortages and consequently a high workload was experienced by staff in the service.
- Supervision and escalation – for example, staff feedback in interviews there was a lack of senior support and limited options to escalate concerns during the OOH period.
- Teamworking and communication – for example, a lack of awareness about H24 and an inconsistent understanding of accepted practices for referring-in was found across the Trust.
- Environment – for example, local environment characteristics affected processes such as the quality of the handover.

The HF workstream also identified key facilitators (e.g. specific roles, access to key information) and identified work system themes that impacted staff wellbeing. Seven types of facilitators were identified and four of these themes can be considered as the counterparts for the barriers described previously, namely good teamwork versus team concerns, tools and information that support communication and access to specific information versus poor transmission of information and communication, and access to specialist advice and support OOH versus limited availability of expertise OOH. The remaining facilitators identified included the role of specific staff groups and teams, key meetings and handovers, and supportive tools and processes that individuals use to facilitate work. The qualitative data from the review also highlighted that staff, both those working in the service and referring into the service saw the H24 team as an asset due to their expertise and the support they provide to the wider hospital setting and to other members within their own team.

Although the HF workstream did not directly assess levels of burnout or professional wellbeing of the H24 staff as part of the review, elements associated with staff wellbeing were identified among the barriers and facilitators. These included work system elements that negatively contribute to staff fatigue, professional wellbeing, general wellbeing concerns and positive elements associated with staff wellbeing. These can be seen as having a range of impacts both on staff and the organisation. Areas of concern that contribute to staff fatigue and the general wellbeing concerns can be seen as having a more immediate impact – namely proximal outcomes as described by the SEIPS 2.0 model, whereas those associated with professional wellbeing may have a longer-term impact on

staff wellbeing and the organisation – namely the distal outcomes as described by the SEIPS 2.0 model (Holden et al., 2013).

Recommendation Development from the OOH Review

As a result of these findings, the HF workstream developed eight general recommendations targeted at different levels within the work system to address the identified barriers. These general recommendations are depicted in Figure 1 and specifically targeted larger system issues as these often provide the context from which more local barriers emerged. These recommendations provided the framework for the further development of an additional 54 more specific recommendations, generated by the wider project team that included the head of the service.

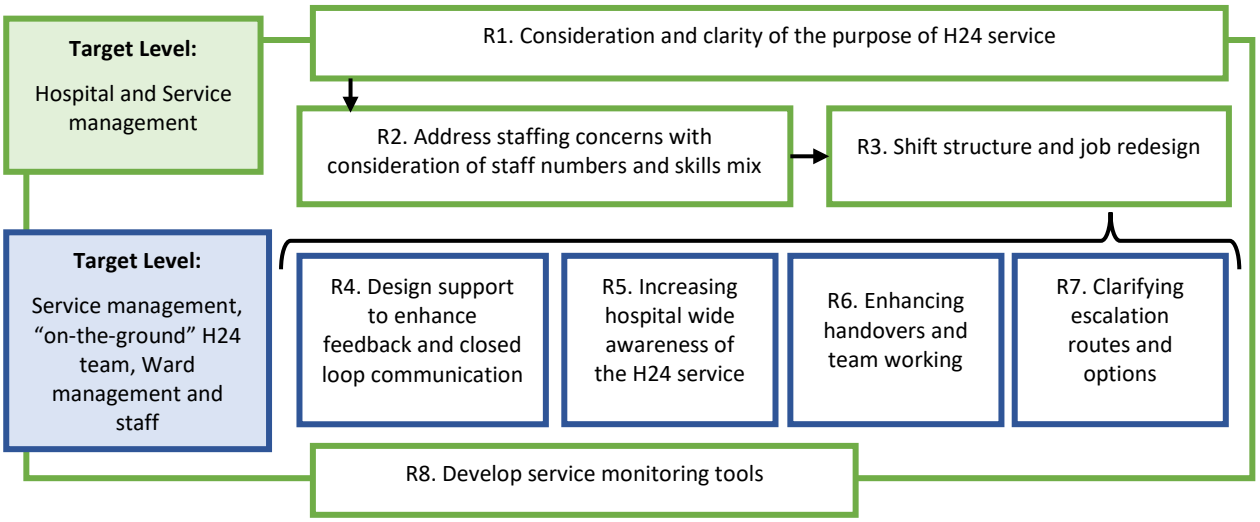

Figure 1: The recommendations from the OOH review and the proposed implementation order grouped according to the target level.

The 54 specific recommendations were set out across six categories, listed with examples in the table below. The function of the recommendations was to guide future service system redesign and to support work system monitoring tool development, as ongoing OOH work system monitoring was identified as essential.

Table 1: Abridged list and examples of the specific recommendations generated from the OOH Review

Category	Examples
Data (8 recommendations)	• Improve data quality using software solutions and use of H24 coordinator team.
Staffing and Workload (14 recommendations)	• Expand resident doctor medical staffing levels. • The nurse practitioner role should be formalised, expanded and up-banded for those with the appropriate skills.
Supervision and escalation (9 recommendations)	• OOH consultant line management is needed for de-specialised medical registrars. • The accepted agreement on which consultant is responsible for general medical escalations needs to be clarified and publicised.
Teamwork and Communication (12 recommendations)	• An automated check-in/-out process should be developed to monitor shift attendance. • OOH handover processes should be standardised and compulsory.

	• Deliver education on how to use, refer-in and feedback to H24 for all departments.
Environment (7 recommendations)	• An appropriate environment for handover should be sought. • Phone and WIFI signal blind-spots should be addressed.
Accountability (4 recommendations)	• Divisions are responsible for acting on the findings and recommendations, collaboratively where appropriate.

Recommendation Implementation and Work-to-Date

As of November 2025, 32 of the 54 recommendations have been completed. Of the remaining 22 recommendations, nine can be considered larger principles and therefore, actions that should remain ongoing. The recommendations identified as principles have been included in Table 2.

Table 2: The recommendations that may be considered as larger guiding principles.

Category	Recommendation
Staffing and Workload	Future work system redesign should: • Consider and address all work-system barriers including staffing, workload and monitoring of workload. • Include a review of shift start and end times to enhance capacity and demand matching, especially in the twilight/ early night shift. • Explore new ways of working in close alignment with non-medical multidisciplinary staff.
Supervision and Escalation	• Future work system redesign should establish the appropriate ratio of doctors and resident doctors for OOH working. • Resident doctor medical workforce business cases should include the costs of the associated clinical and educational supervision required.
Teamwork and Communication	• HF Science should underpin any future system redesign and should address all of the work system barriers described, including team concerns. • The in-attendance feature must be used, especially for urgent tasks to promote closed-loop communication and enable team support.
Environment	• Future system design should explore staff concerns in relation to safety and convenience.
Accountability	• It is the responsibility of the divisions to consider the findings and recommendations of this review and, where appropriate, act collaboratively.

Of the remaining 15 open recommendations, two have not yet been started and 13 are ongoing. The two recommendations that have not yet been started, include identifying a geo-mapping solution for task density and a trial of a wayfinding app to assist with navigation around the sites. Both of these recommendations require new technology and have both procurement and financial considerations. The 13 ongoing recommendations include elements of expanding the use of the task management system in other areas and potentially for other functions, changes to the staffing numbers with in the team for which business cases have been submitted, development of tools to support systems monitoring, and the determination of limitations of current resources (e.g. Wi-Fi blind spots).

Since May 2022, the HF team has been supporting the H24 management team through an advisory role on the implementation of the above recommendations. In addition to this, the HF team have been working with the service since the review, through various other activities such as the development of a professional wellbeing survey to supplement other service monitoring tools and through the support of listening events with their staff. Through this continued work, qualitative

data has been gathered since the review (2021/2022) in both 2023 and 2024. An overview of the qualitative data captured since the initial OOH review is depicted in Figure 2. Although at the time of data capturing, the aim was not to evaluate the implementation of the recommendations, upon a secondary review of the data, these qualitative results have revealed impact of some of the recommendations and describe changes to the work system already.

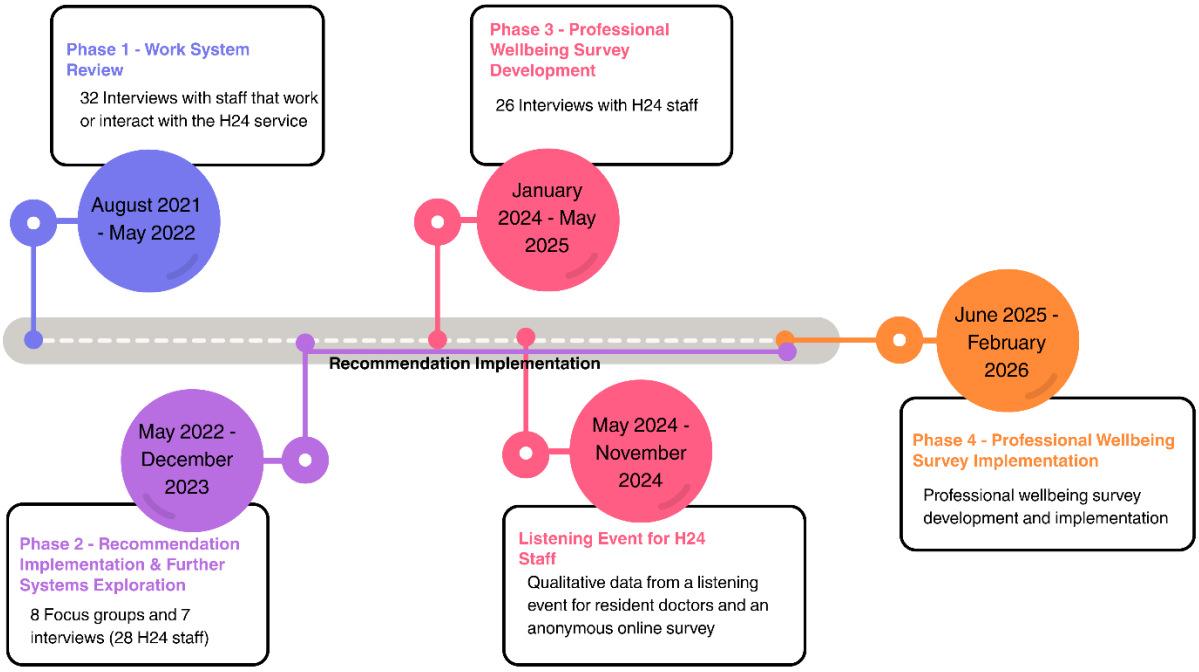

Figure 2: The input of the HF team and qualitative data captured since the initial OOH review in 2021/2022.

From the 2024 results, which included 26 interviews with H24 staff members, multiple elements were described that reflected changes in state associated with the barriers identified in the original review. As part of the interviews, staff were asked to describe their current experience of work in this service and although the recommendations were not directly evaluated, staff commented on various elements of the restructuring of the service. Key changes to the work system staff feedback included that they felt the invisible workload had reduced, handover practice had improved, team support was still described very positively, and that most staff felt comfortable escalating queries.

To expand on the above, an example of a key barrier from the review that majority of staff interviewed in 2024 felt had improved was the amount of invisible work they were asked to complete. As part of the interview, staff were asked directly how much of the workload they thought they received through the task management system. The majority of staff mentioned they had noticed they were receiving less non-documented work from the wards but that continued effort was still required to remind ward staff to submit tasks through the task management system. This is associated with multiple barriers from the initial review namely both awareness of the H24 service and invisible workload.

Additionally, an essential consideration for system redesign is to ensure facilitators for work are not unintentionally “designed out”. An example of a known facilitator further embedded into this service is through the formalisation of the nurse practitioner role, a recommendation described in Table 1. This staff role developed from the H24 nurse coordinator role, by upskilling a group of

these staff and expanding their role from triaging tasks to including clinical tasks they could support the wider team out on the wards with. This has contributed to strengthening elements of the H24 team that were already described as a facilitator in the initial review. This is now a permanent role within the H24 service and the team has a group of 9 nurse practitioners in the service. The contribution of this role to enhancing team support as determined in the initial OOH review is described by the quote below.

> *"Sometimes again if I am able to go down and just sort of reassure the doctor…even if there's elements of things I can do or even signpost the doctor in the right direction…which I think is quite helpful sometimes and it kind of takes quite a sort of a load of pressure off the doctor… I think sometimes seeing the coordinator out and about,… you can just see this kind of reassurance in their face" (H24 Nurse Coordinator, 2022).*

The benefit of this role was further highlighted in the qualitative data captured through interviews conducted between January and September 2023 with the staff describing this group as playing a key role in the optimization of workflow and resource allocation within the H24 service. Furthermore, the expanded elements of this role were described as enhancing job satisfaction of this particular staff group when it was trialled 2021/2022. When the Areas of Worklife Survey (Leiter & Maslach, 2000) was conducted in 2023 with H24 staff, the nurse practitioner group and the H24 coordinator (now referred to as clinical nurse specialist) groups both scored the most positive alignments for the different domains of the workplace. Additional results to this component of this work can be found in the paper by Miles et al., 2024. Currently, in the trial of the service's own professional wellbeing survey, in September/October 2025, the nurse practitioners were the best scoring staff group, with all domains of the professional wellbeing survey scoring above good and similarly in January 2026, they scored above good for all but one of the five domains of the professional wellbeing survey. The support that both this staff group and the H24 clinical nurse specialists provide the service has been repeatedly highlighted in the qualitative feedback of the service's own professional wellbeing survey, demonstrated by the quote below.

> *"The H24 team make a big effort to be supportive. They try and place residents in areas they feel comfortable working. This is not always possible depending on the staff mix, but they make you feel that they are there for support if you need it." (Resident Doctor, September/October 2025)*

Conclusion

The HF component of this project initially started as a smaller component of a larger review for this service. However, as the project progressed, the value and unique insight that HF as a science can offer became visible. Through the work system description and use of qualitative data, additional insight was provided to the other work streams and provided a deeper context for the captured quantitative data. As a result, the HF workstream was able to connect well with the other two workstreams to provide a more holistic depiction on the service. This ultimately led to the development of a framework for the recommendations. This highlights how HF is truly a complimentary science and demonstrates the benefit of a collaborative approach.

From the initial work system analysis in the review, this project has grown, expanded and continued well past the initial perceived end date. As a result of the benefit of "capturing what work is like" directly from staff, the collaboration with the HF team has continued over the years and is an element that the service often draws on, not only for planned work such as the development of the professional wellbeing survey but also for feedback to other areas for the service management team.

Although the HF team were originally only commissioned to contribute to this project by delivering a work system's analysis, this grew and expanded to the point that HFE input has now been included across three of the four major phases of healthcare system redesign, namely analysis, design, and implementation for this project. The final phase in healthcare system redesign is the evaluation phase. Although this has not officially commenced yet, as highlighted by this paper, elements are already starting to be captured.

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