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Identifying system adaptations to overcome technology-based workflow challenges in a telephone triage organization☆

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ABSTRACT

Call-center-based telephone triage is an example of a complex sociotechnical system relying on successful interactions between patients, callers, and the integration of many digital technologies. Digital technologies such as computer decision support systems are used to standardize triage outcomes with little consideration of how these unique healthcare systems adapt to maintain functionality in response to real-world operating challenges. Using structured observations of call handlers in two call centers and guided by usability heuristics and the concept of 'workarounds', this paper aims to investigate the effects of technology design on workflow and system adaptations. Opportunities for improvement are highlighted, particularly, assessment prompts, and updating software to reflect dynamic real-world situations. Interactions between system components, especially technological and organizational processes affected workflow, making adaptations at the individual and organizational levels necessary to ensure callers could be triaged safely. System designers could consider these findings to improve systems and procedures during challenging periods.

1. Introduction

Due to their social, unpredictable nature, healthcare systems have been described as hypercomplex, relative to other traditional complex systems (Long et al., 2018). This is true of remote systems which deliver care at a distance like call-center-based telephone triage systems. Telephone triage refers to the assessment of patients' symptoms via telephone, and subsequently sign-posting them to appropriate care. These systems rely on the integration of multiple digital technologies, such as CDSS, appointment booking systems, and electronic health records (EHR), as well as communication systems. In recent years, telephone triage has increasingly been used to manage healthcare resources and avoid overcrowding in hospitals (Islam et al., 2021).

Since the seminal report by the Institute of Medicine Committee on Quality and Safety in Healthcare (2000), 'To err is human', there has been growing appreciation that safety-related outcomes should be considered emergent properties of healthcare systems, resulting from system interactions, rather than the result of a single human failing. Additionally, there has been a shift from investigating 'what went wrong' to 'what went well'. Fairbanks et al. (2014) write "the surprising thing is not that there are so many accidents in health care but that there are not even more" (p. 382). Complex sociotechnical systems like telephone triage organizations often operate at the 'boundary of functionally acceptable performance' (Rasmussen, 1997), avoiding failure, amidst challenging operating conditions. Their ability to respond is termed 'resilience'. Resilience may be designed into the work system (design for resilience) or may occur due to the adaptation of the individual workers, i.e., 'resilient performance' (Disconzi and Saurin, 2022).

Counter to this contemporary thinking about complex sociotechnical systems, in telephone triage organizations (like many other areas of healthcare) there is an increasing push for standardization through the deployment of healthcare information technologies (HIT) such as clinical decision support software (CDSS), to improve patient outcomes and efficiency. It is therefore imperative to understand the effects of such technologies on system outcomes, potential challenges to their successful integration, and the required system adaptations to promote their success. Existing HIT resilience research has been criticized for focusing solely on user behaviour, as opposed to technology itself (Smith

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et al., 2014), or wider work system factors. Moreover, despite its widespread use, evaluative research of safety and resilience in telephone triage, and other telecare systems is limited (Guise et al., 2014; Huibers et al., 2011; Poots et al., 2024). Therefore, this study aims to investigate the interactions between usability, the wider work system, and adaptations across the work system, using the English 'NHS 111' telephone triage system as an example.

2. Literature review

England's National Health Service (NHS) has an Integrated Urgent Care (IUC) system, which was developed to better coordinate the many urgent (not emergency) care resources (NHS England, 2013). The 'front door' to this system is the NHS 111 telephone triage service (Pope et al., 2017), accessed via a three-digit telephone number (i.e., 111). NHS 111 triages upwards of 50,000 callers per day (NHS England and NHS Improvement, 2023). At the end of a call, services such as General Practitioner (GP) appointments, and ambulances can be arranged by call handlers for patients (see Fig. 1 for an overview). The service is provided by locally commissioned organizations, like social enterprises and ambulance trusts. The workforce differs to similar services worldwide, in that non-clinical call handlers (known as Health Advisors) are more numerous than Clinical Advisors (73%:27%, respectively; NHS England and Health Education England, 2018). Health Advisors (HA) are responsible for initial triage, while Clinical Advisors (CA) take over complex calls and provide medical advice as required.

Despite a growing appreciation that healthcare systems are required to be adaptive to maintain functionality amidst challenges to operating conditions (Lyng et al., 2022), healthcare has become increasingly invested in standardizing care as a means to improve quality and safety (Perry and Fairbanks, 2015). In telephone triage organizations like NHS 111 this has resulted in the adoption of healthcare information technology (HIT) such as CDSS to standardize decision-making (Tariq et al., 2017). For example, Fig. 2 shows the call phases and software that makes up the 'complex sociotechnical system' that is the NHS 111 system (Morgan and Muskett, 2020). NHS 111's CDSS is considered especially important for non-clinical Health Advisors to follow stringently, since they do not have the 'protection of clinical expertise' (Morgan and Muskett, 2020) to appropriately and safely offer advice to patients. Whilst the CDSS is designed to choose the 'safest option' in absence of clinical knowledge (MacLellan et al., 2023), NHS 111 has been implicated in serious incidents resulting in patient harm (HSIB, 2022; Morgan and Muskett, 2020; Rees et al., 2017), suggesting there are wider system factors contributing to safety outcomes.

The rationale for standardization and technology adoption is that humans are fallible and should be designed out. However, resilience is also thought to be influenced by the design of the wider work system including digital technologies. The design of decision-making software used in telephone triage has been criticized for its assumptions that healthcare provision is simple and linear (Morgan and Muskett, 2020) and illnesses can be reduced to a single set of symptoms (Murdoch et al., 2015). As a result, usability issues can arise, creating workflow obstacles (Unertl et al., 2010) and risks for patient safety (Tariq et al., 2017). One example of such an obstacle in the context of telephone triage is 'interactional misalignment', where information required by the software does not fit that which is available or provided by the caller (Morgan and Muskett, 2020). This interactional misalignment was implicated in patient safety incidents highlighting the detrimental effect of workflow challenges arising due to the interaction between the technical and social components of a system.

Workflow is a work process dependent upon wider system factors such as: the physical environment, tools, technology, people, organizational, and task conditions (Carayon et al., 2012; Holden et al., 2013). Workflow issues create the need for system resilience including adaptive resilient behaviors (termed 'resilient performance' by Disconzi & Saurin in 2022). When faced with surprises or obstacles posed by 'brittle technology' (Fairbanks et al., 2014), human operators are thought to contribute to system performance, by monitoring, anticipating, and responding to challenges (Wiig et al., 2020). We propose workarounds are one example of adaptive behaviour influenced not only by technology, but the wider work system. In healthcare, a workaround is described as "a deviation from an intended work process … used to overcome an obstacle, by a practitioner responsible for meeting a work demand; the deviation is likely an active adaptation to the process that is documented in policies and procedures" (Patterson, 2018, p. 281).

There is existing evidence suggesting telephone triage staff adapt to problems in the technology using workarounds, despite an increase in standardization in these systems. For example, call handlers in the NHS

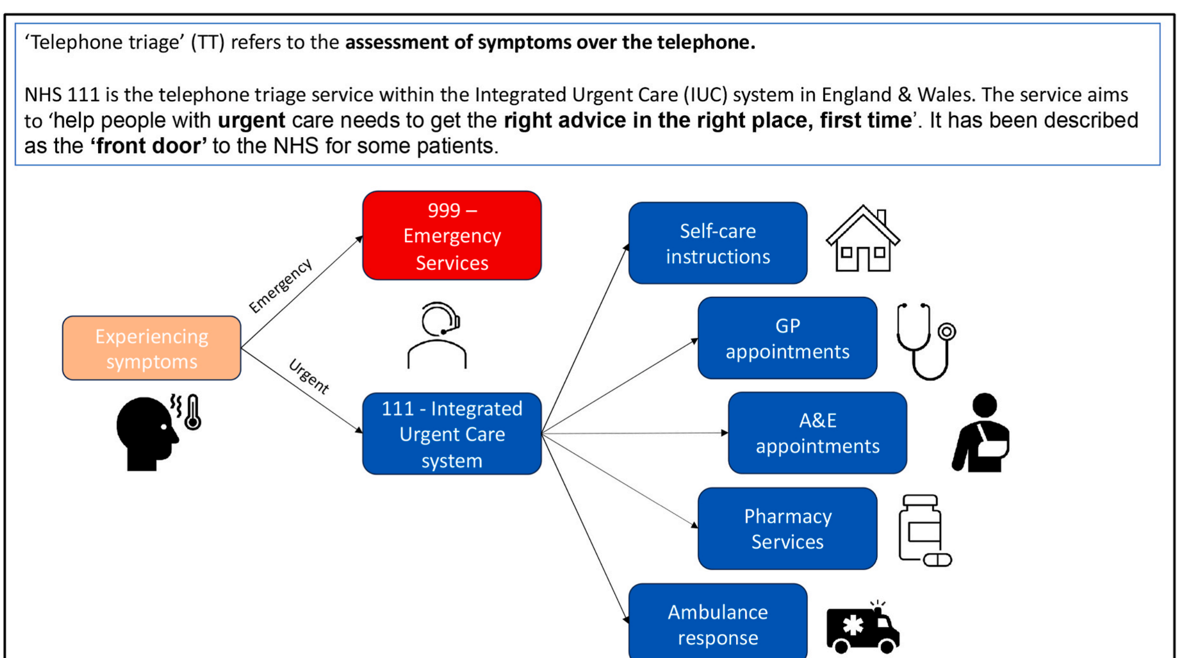

Fig. 1. A simplified model showing NHS 111's role in the Integrated Urgent Care System.

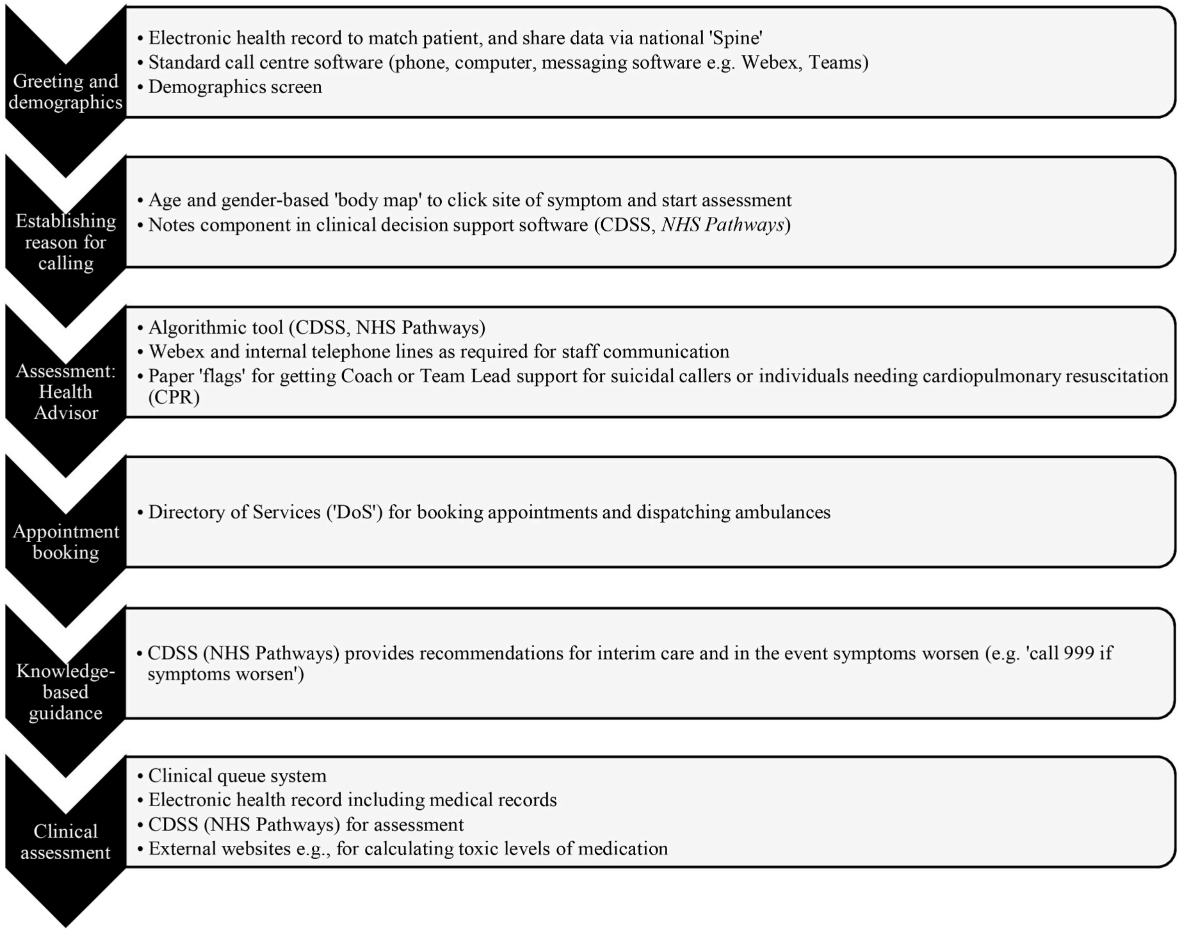

Fig. 2. 'Work-as-imagined': Call phases (left) and examples of software used and their purposes (right) in an NHS 111 call.

111 system utilized 'interpretative flexibility' skills to translate the language of the computer to the language of the patient (Turnbull et al., 2012). Rather than negatively affect outcomes, these may ensure callers are safely triaged. Identifying workarounds can be useful for aligning procedures based on 'work-as-imagined' to more accurately reflect 'work-as-done' which could improve overall system resilience, and outcomes such as efficiency and safety (Perry and Fairbanks, 2015).

To understand the relationship between technology design, workflow, and adaptation within a telephone triage work system, the current study draws on usability inspection methods which provide an indication of how easy it is for human users to interact with technology. Components of usability are: learnability; efficiency; memorability; errors; and satisfaction (Nielsen, 2012) which can be investigated using heuristics (Nielsen, 1994) – rules of thumb for good design – to identify technology design improvement priorities (see Fig. 3) in a process termed 'heuristic evaluation' (e.g., Klarich et al., 2022). When heuristics such as these are not followed, this can increase strain on cognitive resources and the likelihood of error (Klarich et al., 2022), as well as workflow obstacles, which may require resilience further in the work system. Such instances are termed 'heuristic violations' in heuristic evaluation. One previous study applied heuristic evaluation to an Australian telephone triage service, highlighting challenges for efficiency and safety, and subsequently improvements to the technologies deployed.

There are several limitations of heuristic evaluations including their use of offline, simulated scenarios and focus on technology itself, as opposed to system outcomes. To overcome these limitations, and in response to a call for more 'reality-based' safety science research observing actual work (Rae et al., 2020), we extend the previous study

Nielsen's Usability Heuristics

1. Visibility of system status
2. Match between the system and the real world
3. User Control and Freedom
4. Consistency and Standards
5. Error Prevention
6. Recognition rather than recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Help users recognise, diagnose, and recover from errors
10. Help and documentation

Fig. 3. Nielsen's 10 usability heuristics. Adapted from: Nielsen, J. 1994. 10 usability heuristics for computer interface design. Available at https://www.nngroup.com/articles/ten-usability-heuristics/).

by Tariq et al. (2017) to include observations of actual use of telephone triage technology in real-time, during live calls. Morineau and Flach (2019) previously highlighted the potential benefit of utilizing 'bottom-up' methods of analysis such as these in complex healthcare systems.

Of course, outcomes of complex sociotechnical systems including technology usability, workflow or safety should be considered emergent properties resulting from interactions between system components. To understand the relationships between the people, technology, and wider work system factors, models for investigating complex sociotechnical systems have been developed to identify and understand complex sociotechnical work system designs, processes, and outcomes (Carayon et al., 2015). One popular model in healthcare is the Systems Engineering Initiative for Patient Safety (Carayon et al., 2006). SEIPS is a multi-level, input-process-output model for investigating healthcare system outcomes as a result of interactions between work system components (see Holden and Carayon, 2021 for an overview). The second iteration, SEIPS 2.0 (Holden et al., 2013) was designed to include aspects of resilience engineering, such as the adaptation of systems, i.e. that systems receive feedback and intentionally, or unintentionally adapt either in the short-term or long-term.

Previously, it has been suggested that Successful HIT integration is dependent on wider system factors (Bayramzadeh and Aghaei, 2021; Dunn Lopez et al., 2021) such as those outlined by SEIPS, yet HIT technologies are seldom tested in actual clinical work environments (Carayon et al., 2012). As a result, HIT is likely based on 'work-as-imagined' by designers and managers, as opposed to 'work-as-done' by healthcare staff, which could contribute to usability and workflow problems previously discussed. HIT designers have been criticized for not considering user needs (Karsh et al., 2010) and under-appreciating the complexity of healthcare systems (Barrett, 2021). The current study therefore aims to investigate in real-time, the influence of technology usability embedded in a healthcare work system, on safety and resilience (in the form of adaptive workaround behaviors and adaptations to system processes) by observing firsthand human-system interaction. It is anticipated this will provide information on 'work-as-done' to inform processes and priorities for system redesign.

3. Study context

This study was designed to complement a previous Macroergonomic Analysis and Design (MEAD) study which mapped the sociotechnical system components in a telephone triage organization and identified system-specific patient safety risks, and the influence of the work system (for details of methodology, readers can consult Poots et al. (2023). The interview component of the MEAD study found mixed opinions regarding the effects of technology design on system safety. Additionally, interview participants described adaptive behaviors, but it was unclear as to the effects on system resilience and/or patient safety. Interview participants also described adaptive behaviors to overcome challenges (e.g. keeping calls open before out-of-hours) but these were inconsistent. Since interview studies about technology may be less reliable than observing use of the technology itself (Tariq et al., 2017), a more technology-focused analytical method was desirable. Therefore, the current study adopted an observational approach to investigating technology design, use (specifically adaptive behaviour), the effects and relationships with the wider work system (and its influence on system adaptation and resilience).

In summary, telephone triage exemplifies a complex sociotechnical healthcare system which relies extensively on technology to facilitate healthcare interactions and standardize care. We propose work system factors (e.g. technology usability) influence work processes (e.g. workarounds indicative of adaptive behaviour, or organizational adaptations) which affect system outcomes (e.g., safety) positively, or negatively. Considering a paucity of evaluative telephone triage research generally (Poots et al., 2024) it is hoped the exploration of the wider work system may also provide context for interested parties to ascertain the generalizability of identified workflow obstacles to their respective settings. To encapsulate the wider system factors and interactions which contribute to the emergent outcomes like usability and adaptation, the current study uses themes from the Systems Engineering Initiative for Patient Safety (SEIPS) framework (Carayon et al., 2006). To address the research gap in telephone triage and extend our knowledge of factors affecting safety performance, this study aims to:

1. Analyze the usability of telephone triage healthcare information technology (HIT), and its effects on workflow
2. Identify workarounds indicative of system resilience
3. Apply the SEIPS framework (Carayon et al., 2006) to understand wider system factors contributing to workarounds

To do so, it will deploy an observational method guided by usability, systems thinking, and resilience principles to explore the following research question: "*What is the relationship between the work system, technology design, and system adaptation?*"

4. Materials and methods

4.1. Ethics

Ethical approval was granted locally, according to university policy. No personal or sensitive caller data was recorded or analyzed, since worker interaction with the system was the focus of the study. The observational method was like regular auditing procedures in the organization, to avoid any undue stress. All participants indicated their informed consent by signing an information sheet and consent form. Participants were told they could withdraw during the observation, or after, via email before an agreed date. Before observations began, participants were asked the time of their next break, to ensure the study did not interfere with scheduled rest time during their shift.

4.2. Pilot study

To test the observation template and procedures for conducting observations and ascertain whether there was a basis for exploring the effects of technology on system adaptation, a pilot study was conducted by the first author in one call center in September 2022. The first author attended the call center for two days and observed call handlers taking calls and interacting with the software. Examples of heuristic violations and descriptions of adaptive workaround behaviors are outlined in Table 1. The observation template was changed slightly to provide more space to write observations about the technology.

4.3. Observer information and preparation

The observation team ($n = 3$) included two human factors researchers and one clinician with over fifteen years of experience in the organization and as a clinical trainer in the digital technologies being investigated. All observers were familiar with the technology, with the HF researchers having carried out research in this, and a similar organization before (e.g., Morgan and Muskett, 2020). Having a clinical expert was considered important to identify clinically relevant issues for patient safety and explain the significance of clinical information to other non-clinical observers. To standardize observations and improve validity and reliability of the data collection, the team of observers met prior to data collection, to align understanding of the usability heuristics and workarounds. During this meeting, the first author delivered training in heuristics and workarounds using examples of violations of

Table 1
Examples and descriptions of violations of good design heuristics and workarounds observed in the pilot study.

Examples and descriptions of heuristic violations	Descriptions of observed workarounds
Visibility of system status: No available information on ambulance times or availability	Over-ride disposition of ambulance when there is low availability
Match between system and real-world: Hospital system didn't recognize caller's accent	Calling a GP directly on behalf of a caller who expressed difficulty getting through
Error prevention: No spell check for notetaking	Boxes to confirm provision of advice checked prior to giving the advice
Recognize, Diagnose, and Recover from errors: Error messages are the same color as normal text	Using a postcode finder website or 'What3Words' for a caller who didn't know their postcode

good design heuristics (hereafter referred to as 'heuristic violations') and adaptive behaviors observed in the earlier pilot study.

4.4. Data collection procedure

Three observers (two human factors researchers and one clinician) observed telephone triage workers over three consecutive days, in two call centers. Two observers (HF researchers) attended one call center and the third attended a second call center. Observers were introduced to participants by Team Leads, who have a remote overview of call handlers' availability, so as not to cause disruption during calls. After this, a combination of opportunity (walking up to available workers) and snowball sampling (asking to recommend a colleague) was used to recruit participants. Both Health Advisors (HA) and Clinical Advisors (CA) were observed in the study.

First, call handlers completed a consent form and were provided with instructions and given the opportunity to ask questions. Staff were observed one at a time by one observer. The observer sat next to participants where they could see their display screens and connected to their headset using a one-way headphone splitter (so observers could not talk to patients), to understand the context of the calls and call phases and software.

As no personal technology is permitted in the call center, structured observation templates which were tested and improved following the pilot study were provided to all observers to record their observation data. A new template was used for each call handler observation. There was space to record demographic data relevant to the aims of the study, i.e., worker type (clinical/non-clinical) and tenure in months. A random participant number was on the top of each individual template book, and no unique identifying information was obtained. To assist and standardize the captured data, headings on the template were provided as follows: name of usability heuristic of interest, with brief guidance; description heuristic violations observed; frequency of these violations (if observed more than once); and severity rating for each heuristic violation (in line with the heuristic evaluation technique; see Table 2). As this was the first usability study of NHS 111, all ten of Nielsen's (1994) usability heuristics were listed on the observation sheets (Fig. 3). The back of the template data collection booklet had space for recording details of observed workarounds and additional notes (e.g., responses to clarifying questions in between calls, or information volunteered by call handlers). No caller information was collected, other than brief details of the presenting symptoms, where relevant to technology usability. Each observer used these templates to record their data while observing and listening to the calls.

Fifteen observations took place over a three-day period, in two call centers in England, in which both Health Advisors and Clinical Advisors are employed by a social enterprise. Observers attended the call centers for 8 h per day. Calls ranged from approximately five to 30 min. A range of clinical complaints and symptom acuities were presented, from dental pain to suicidal ideation. Due to a high number of staff working from home, call center occupancy was low. Therefore, two members of staff were observed twice (one clinical advisor and one health advisor). However, no staff were observed more than once in the same day, or by the same observer. Three Clinical Advisors (CA) and 10 Health Advisors (HA) were observed (Table 3 outlines demographics). This ratio reflects the non-clinical worker majority in the NHS 111 system. The median length of tenure of all participants was 15 months. The newest staff member observed had worked for the organization for three months, and the longest serving staff member observed had worked in NHS 111 and its predecessor (NHSDirect) for 23 years (*Range* = 22.75 years). Ten users were novices (one clinical; nine non-clinical). Novice users are defined as those with fewer than eighteen months' experience (both clinical and non-clinical users). This criterion for expertise is based on the training requirements for becoming a CDSS Coach (trainer). Two experienced Health Advisors were also CDSS Coaches.

Between calls, there were opportunities for observers to ask clarifying questions (e.g., "Can you explain why you navigated backwards in the software?") of the observed call handlers. This was limited to 2 min during busy periods, to avoid service disruption. If call queues were very busy and calls connected automatically to the next, questions were delayed until the next opportunity. An offline version of the CDSS could be used by call handlers to run through scenarios encountered during calls. Workers were observed for 2 h, to their first scheduled break, or the end of shift (whichever came first). At the end of the observation period, participants were read a standardized debriefing statement. If requested, a copy of the information sheet and consent form was emailed to them after the visit.

Table 2
Classification of severity of violations of good design heuristics, from Tariq et al. (2017).

Severity Rating	Meaning
0	Not an issue at all
1	Cosmetic problem only: should only be fixed if extra time is available
2	Minor usability problem: fixing this should be given low priority
3	Major usability problem: important to fix, high priority
4	Usability catastrophe: imperative to fix this

4.5. Data analysis procedure

All authors met to share their observational data and initial ideas. Following this, the first author collated all individual observation data into a single Microsoft Excel spreadsheet. Participant demographics were analyzed using descriptive statistics (e.g., number of workers, worker type) calculated in Excel to understand the representativeness of the workforce. Heuristic violations were arranged according to the call phase in which they were observed (e.g., greeting, assessment, appointment booking) and the type of user being observed (i.e., Health/Clinical Advisor). When all observation data was collated, all observers met first to discuss the heuristic 'violations' (deviations from good design principles, or heuristics), determine their severity (i.e. likely impact on safety) on the standard 5-point scale used in heuristic evaluation (from 0: 'not a usability problem at all', to 4: 'catastrophic', as outlined in Table 2). Next, the team discussed the potential effects of design issues on safety (e.g., negative, positive, negligible, unsure). Conflicts were resolved and consensus ascertained group discussions.

Following the heuristic evaluation analysis, the descriptions of the system adaptations were analyzed. To do this, the first author deployed a hybrid deductive-inductive thematic analytical approach (Fereday and Muir-Cochrane, 2006). Codes pertaining to adaptation descriptions, rationale, and possible effects on patient safety (e.g. negative: safety risk or positive: resilience) were coded inductively based on the available qualitative data, and deductively using work system components from the SEIPS framework (Carayon et al., 2006) to ascertain the potential interacting factors contributing to the adaptations. Themes were agreed upon by the observer group through discussion. There were no disagreements between observers: all observers reached a consensus during the discussions on themes related to workaround rationale, effects, and contributing system factors. These were placed into a matrix to

Table 3
Demographics of call handlers observed.

Worker Type	Number observed	Median Tenure	No. Experts (Novices)
Clinical Advisors	3	24 months	2 (1)
Health Advisors (non-clinical)	10	15 months	3 (7)
Total	13 (15 observations)	15 months	4 (9)

understand interactions (see Table 8).

5. Findings

5.1. Heuristic evaluation

Table 4 and Fig. 4 show frequencies of severe heuristic violations. 'Match between the system and the real world' was the most frequently violated heuristic ($n = 18$) and had the most 'catastrophic' (most severe) violations requiring immediate attention ($n = 3$). The second most frequently violated heuristic was 'flexibility and efficiency of use' ($n = 15$); however, these violations were considered minor, not requiring immediate attention. Violations relating to 'error prevention' and 'user control and freedom' were identified 14 times; one in each group was considered 'catastrophic'. The heuristic with the most 'major usability problems' (Severity Level 3) was 'help users identify and recover from errors', suggesting this merits prompt attention.

The examples in Table 4 illustrate the influence of the wider system on 'work-as-done' and their interaction with design issues which make work more difficult for call handlers. For example, callers report many experienced symptoms, but the user could not include them all due to limitations and inflexibility of the software design. Organizational conditions such as the imposition of a 30-s wrap up time was implemented by technology to increase efficiency, but this affected information recording at the end of calls, and the efficiency of the next call. Heuristic violations directly led to workarounds, for example, constraints such as check boxes were not used as intended. Rather than being checked after advice was given, checkboxes were checked whilst information was recited from memory, to improve workflow.

5.1.1. Workarounds (all): descriptive statistics

Fifty-three workarounds were observed which had different effects on safety (e.g. positive, negative, negligible). Some workarounds were repeatedly observed, for example, call handlers changing the wording of the CDSS to aid understanding was observed six times. Observed workarounds were higher for non-clinical Health Advisors (HAs, $n = 37$) than Clinical Advisors (CAs, $n = 16$), which likely reflects the higher number of observations of HAs. However, the ratio of workarounds to number of worker type observations was slightly higher in the clinical sample than the HA sample (1:4 and 1:36, respectively), suggesting clinicians may use the system more flexibly (though the sample is too small to ascertain significance). Three types of workarounds observed were common to both call handler types. The call phases with the most workarounds were Health Advisor assessment ($n = 14$), appointment booking ($n = 8$), and clinical assessment ($n = 6$), indicating call phases in which HIT could be prioritized for improvement.

Table 5 outlines descriptive themes for workarounds used by Health Advisors, according to experience level. Workarounds were similar between novices and experts. Both groups used search engines for recording notes, cited advice from memory, answered questions on the computer before the caller, and deviated from process or technology protocols. Only expert HAs gave alternative instructions to callers (i.e., referring callers elsewhere or giving alternative instructions not on the computer). Only novice HAs sought informal support in the call center rather than using the formal telephone lines and used the offline version of the software during a call to check potential outcomes.

The sample of clinical staff was small ($n = 3$), as many clinicians work from home. Sixteen workarounds were observed (Table 6). Nine of these were attributed to expert CAs, and seven to novices. The most frequent workaround theme was 'deviation from assigned role in queue to provide quicker care'. Both experts and novice clinicians deviated from their allocated role in the clinical queue, taking calls from patients who were not next in their allocation. Reasons for this were to avoid calls 'breaching' target wait times, to assess 'pinked' (i.e., most urgent calls in the system, indicated by a pink color) calls more quickly, and to wait until Out-of-Hours provision started, to ensure a caller saw a GP that day. Three workarounds entailed 'override CDSS disposition', whereby expert clinicians rejected computer dispositions (novice users did not). On two occasions, the novice clinical advisor changed the wording of the assessment questions to make the language more colloquial, which experts did not. The effect of this merits further study, as colloquial language could change the medical meaning of questions. Given the small sample size, however, noted differences between experience levels could result from individual differences.

Workaround data collected during observations and discussions with call handlers was coded by observers according to their likely effects for patient safety. Seventeen workarounds were considered likely to positively affect safety (indicating resilience). These workarounds were

Table 4
Number of violations of good design heuristics by severity.

Heuristic Name	Total Frequency of violations of heuristic	Frequency of 'catastrophic' (L4) violations	Frequency of 'major usability problems' (L3) violations	Example of heuristic violation (severity level)
Visibility of system status	13	0	2	Despite GP appointments being unavailable for months, availability in DoS always appears 'green' as though there is good availability (L3)
Match between the system and the real world	18	3	0	Need to select single symptom is not representative of how patients present their symptoms: caller is forced to choose one (L4)
User control and freedom	14	1	2	HAs are connected to the next call after 30 s, even if they are still entering details of the previous call (L4)
Consistency and standardization	10	1	1	No standardization for typing clinical notes in the free text box shared by CAs and HAs. Some write capitals to identify CA notes, others do not. (L4)
Error Prevention	14	0	1	No way for CAs to search for calls on clinical queue where clinical input is required. CAs must look from top down manually (L3)
Recognition rather than recall	11	0	2	In the case of manual ambulance dispatch, addresses must be retained in working memory. One HA used google search engine to make notes to self of the address since it was no longer visible on the screen (L3)
Flexibility and efficiency of use	15	0	0	Precision is required for demographics, no pop-up suggestions (L2)
Aesthetic and minimalist design	9	0	3	Queue system is very hard to read and no way to change settings. There may be a risk of alert fatigue (L3)
Help users recognize and recover from errors	6	0	4	Error messages/constraints are often ignored e.g., tick boxes to confirm worsening advice are ticked ahead of advice giving (L3)
Help and documentation	9	1	0	For validations, information about local ED protocols was missing, e.g., information about swallowed battery not present when validating calls for swallowed items (L4)

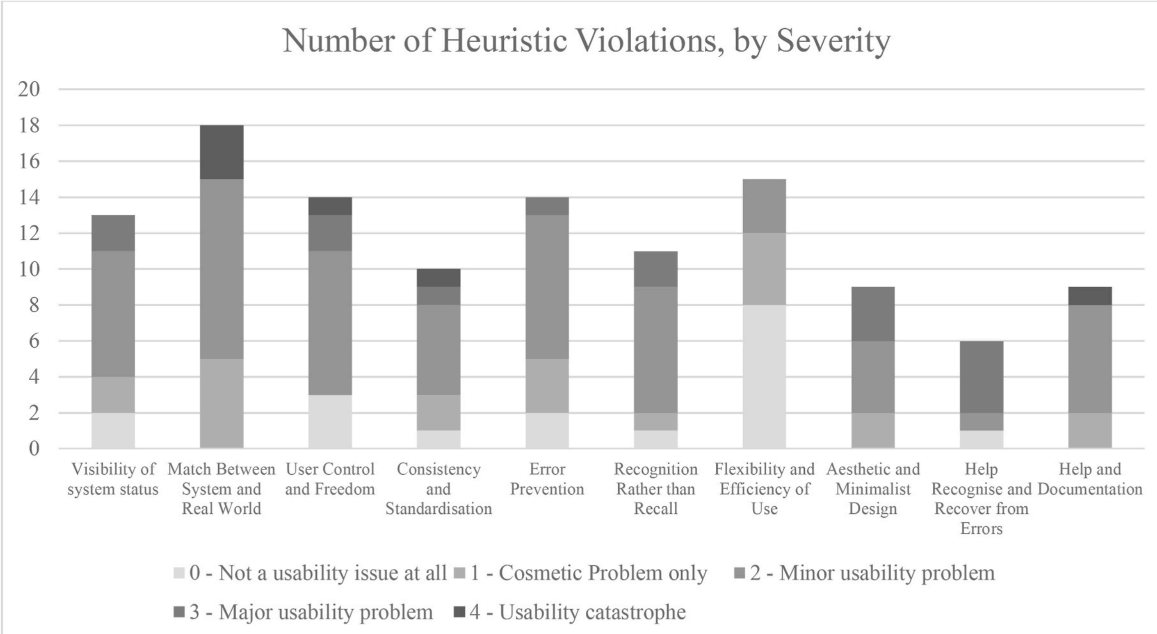

Fig. 4. A bar chart showing number of heuristics violated in each category, and severity ratings.

Table 5
Frequency and nature of workarounds used by Health Advisors (all outcomes).

Workaround codes: Health Advisors	Total	Frequency: Experts	Frequency: Novice
Use search engine as notes	5	3	2
Skipping questions	1	0	1
Language change: medical	4	2	2
Language change: improve communication	3	2	1
Written communication workaround	1	1	0
Refer elsewhere	1	1	0
Cite from memory	2	1	1
Ignore guidance or technology	4	2	2
Use of paper tool	2	1	1
Give alternative instructions to technology	2	2	0
Use multiple pathways in call software	1	1	0
Use multiple pathways in offline software	1	0	1
Support seeking via unofficial channel	1	0	1
Enter answer before received from caller	5	3	2

Table 6
Coded descriptions and frequencies of clinical advisor workarounds.

Workaround Codes: Clinical Advisors	Total	Frequency: Novice	Frequency: Expert
Deviated from assigned order in phone queue to provide faster care	3	1	2
Deviated from script to build rapport	2	2	0
Changed question posed by CDSS	1	1	0
Overrode CDSS disposition	3	0	3
Provided alternative advice to that presented by CDSS	1	1	0
Asked questions not in CDSS: use of a home device (smartwatch)	1	0	1
Asked additional questions based on clinical knowledge	1	0	1
Used external website for guidance	1	1	0
Kept call open until more services were available in Out-Of-Hours	1	0	1
Calculated medication dosage using calculator	1	0	1
Waited on a caller to arrive home before call continued	1	0	1

reduced into fourteen distinct themes by merging duplicates and are displayed by call phase in Table 7. Most workarounds with positive effects on safety were carried out by Health Advisors (HAs). This likely reflects the higher number of HAs, but also the differences in tasks carried out, and software used by HAs and Clinical Advisors (CAs). HAs 'front end' the service, taking as much of the call as possible, whilst CAs are mainly required to call patients back who are on a 'clinical queue', for further assessment, disposition validation, or home management advice.

Between calls, observers asked call handlers about the rationale for observed workarounds. Rationale was coded inductively, and themes developed. These are outlined in Table 7 and consist of:

- 'safety', whereby the behaviour was thought to be safer than the alternative (e.g. not checking toxicity twice manually);

Workarounds indicative of resilience: qualitative descriptions and system interactions.

- 'patient satisfaction', where the workaround was thought to improve the patient experience;
- 'technology design', where a constraint was imposed by the technology itself making the workaround necessary (e.g., the need to enter a valid postcode to proceed with assessment);
- 'external pressures', where there was an actual, or perceived need to manage availability or demand for services, such as ambulances;
- 'efficiency', where the workaround was perceived to expedite the call;
- 'appropriate outcome', where the workaround helped get the appropriate outcome for a caller from multiple options and;
- 'overcome limits of telephone triage', referring to the lack of visual cues; and knowledge related themes which either referred to the lack, availability, or retrieval of clinical knowledge.

The SEIPS 2.0 framework was used to assess the wider system factors

Table 7
Descriptions of workarounds indicative of resilience, and their rationale, by call phase and worker type.

Call Phase	Worker Type	No.	Description (occurrence if more than once)	Rationale Codes
Greeting and demographics	Health Advisor	1	Since callers didn't know the official name of their GP surgery, Google was used to search for GP surgeries (2)	Technology design; Efficiency
	Health Advisor	2	Where phone signal was an issue, HA read the number aloud for confirmation, instead of asking caller to repeat number (as per protocol)	Technology Design; Safety
	Health Advisor	3	When caller didn't know their postcode, an online postcode finder website was used	Safety; Technology Design (requirement); Efficiency
	Both user types	4	Where phone signal was poor and caller had strong accent, the universal alphabet was used to communicate	Patient satisfaction; Technology design
Assessment: Health Advisor	Health Advisor	5	When a caller stated they couldn't follow self-test instructions as they were in a small car and holding a phone, health advisor instructed them to place phone on loudspeaker	Safety; Appropriate outcome; Patient Satisfaction
	Health Advisor	6	Where a third-party caller reported they were next door to their parent (patient), call handler asked them to return to patient's house for triage during a call back (rather than triage as remote observer)	Overcome limits of telephone triage; technology design (accuracy)
	Health Advisor	7	Where symptoms were not linked (chest and wrist pain following a fall), call handler navigated two potential pathways in the CDSS to determine what the optimum outcome may be	Technology design; knowledge limited; safety
Clinical assessment	Clinician	8	When there was no in-built toxicity calculator or procedure to do so, when calculating toxicity, CA checked calculations twice using a phone calculator to ensure they were correct	Safety; Technology Design
	Clinician	9	Where a patient said they had recently been discharged with a rare illness, NHS website used to check for information and their treatment	Safety; Increase knowledge
	Clinician	10	To speed up care for calls which were 'pinked' [flagged for urgency], clinician deviated from the queue even if this was not their assigned task	Safety; Technology design; Efficiency
	Clinician	11	Even if not prompted to, to gather relevant information, clinician asked about underlying health problems	Knowledge available; Safety
Appointment booking	Health Advisor	12	Where they felt it was required, call handler ignored guidelines regarding the number of calls they may need to send to a clinician	Safety; Knowledge limited
	Clinician	13	Since availability is dependent on the time of day, to ensure care is received after GPs close, clinicians deviated from system disposition (e.g., at 4pm, more likely to choose A&E disposition)	External pressures; Safety; Patient satisfaction
Ambulance dispatch	Both user types	14	Since CDSS hasn't been updated to incorporate lengthy ambulance delays for low urgency ambulances (due to COVID pressures), to avoid patients calling back or waiting too long when symptoms worsen, advice printed on paper was read to patient which more accurately reflects the ambulance wait times than CDSS (3)	Technology design; External pressures

which contributed to resilience workarounds. Table 8 shows the numbered workarounds and their influential system components. All workarounds were influenced by multiple system components. Technology and individual (patient/call handler) factors contributed to all workarounds. Individual factors included knowledge of the system itself (e.g., how to navigate) and high acuity symptoms, which enabled and encouraged more flexible use to speed up care. Some technology factors reflected heuristic violations, such as 'match between the system and the real world', 'aesthetic and minimalist design', and those relating to capturing and preventing errors (e.g. in-built system constraints). The availability of reliable, useful technology was also an important technology factor, for example having a mobile phone to calculate (despite these not being permitted in some contact centers).

Technology usability limitations and issues directly influenced the emergence of workarounds, and these could be compounded by wider system factors. External environmental issues such as the COVID-19 pandemic increased demand for services beyond the usual availability, rendering information contained in the technology outdated (for example, ambulance wait times). Additionally, nationally set targets for call answering times influenced organizational conditions, task factors, and technology use, and patient factors such as rare or high acuity symptoms heightened work pressure, resulting in workarounds to both meet targets and keep callers safe. For example, call handlers deviated from queue orders to speed up care to meet time targets or kept calls open in the system until more resources were available for a patient. During calls in which all the above factors were present, call handlers felt more pressure to be safe, despite increased demand. This highlights the importance of symptom knowledge to recognize potentially high-risk patients, as well as designing HIT technology so clinicians can easily identify urgent needs, and navigate the system in an efficient, safe way.

Organizational conditions and physical environment factors were identified least often as rationale themes but provide important lessons for improvement. For example, physical environment factors beyond the design of HIT, such as telephone signal affected workflow and required call handlers to come up with creative solutions, such as using the universal alphabet (workaround 4). Organizational workarounds such as using paper information cards were important for ensuring patients received appropriate advice (workaround 14). Workarounds such as these could be considered when designing procedures and training to align them more closely with 'work-as-done'.

In summary, the analysis outlines the importance of studying the relationships between, and effects of, wider system factors on local technology interaction and resilience, to identify opportunities to improve both design and procedures.

6. Discussion

This study aimed to answer the research question "*What is the relationship between the work system, technology design, and system adaptation?*" To answer this question, the study aimed to identify system adaptations at both the worker level (i.e., adaptive behaviors) and across the wider system (e.g., organizational processes) by identifying adaptive (workaround) behaviors, whilst studying the systemic factors which may culminate in their creation. The study took place in the wake of the COVID-19 pandemic, which posed a challenge to operating conditions across the system. As a result, many adaptive behaviors across the system were identified. It is hoped these findings can inform training, work processes, and technology design to better align them with 'work-as-done' and promote resilient performance and design in similar systems.

Expanding beyond a usability assessment to consider wider system factors helped identify possible interactions between system

Table 8
Work system factors contributing to workaround behaviour, based on the SEIPS 2.0 model. See Table 7 for full descriptions of numbered workarounds.

Work-around number	SEIPS work system components					
	External Environment	Tools and Technology	Individual Factors	Task Factors	Physical Environment	Organizational Conditions
1		General Practitioner Name required for call	Patient knowledge	Need to get through opening stages quickly		
2	Telephone infrastructure;	Telephone number required to proceed; Number displayed on phone hardware	Knowledge; Experience	As above, Sense of urgency as patient rural location	Poor phone signal in area	
3	Ambulance service requires postcode	Postcode required to proceed with call	Patient knowledge	Need to get through opening stages quickly		
4	Telephone infrastructure	Demographics required to proceed with call	Patient accent	Need to get accurate information	Poor phone signal in area	
5		Technology assumes all callers can carry out tasks; Answer needed to proceed and rule out stroke	Patient reporting potential stroke symptoms	Managing patient emotions and technology	Patient in small space	
6		Technology prefers proximity to patient	Third party caller	Need to get accurate information	Caller not in proximity to patient	
7		Technology requires one main symptom to proceed	Knowledge of CDSS algorithms; Caller reporting multiple symptoms after fall	Trying to get most appropriate outcome where conflicting symptoms		
8		No in-built toxicity assessment in CDSS; Proximity to mobile phone	Knowledge of medication risks; Patient reported taking medication			
9		Readily available reliable information	Knowledge of clinician	Infrequent triage symptom		
10	High call volumes; Lengthy wait times; targets set to respond to calls	Color coded queue; risk of alarm fatigue	Clinical knowledge; Patients with higher acuity symptoms	Decision-making regarding prioritizing of patients		Delegation of less urgent triage tasks regardless of queue volumes; teamwork; Pressure relating to call wait targets
11		No prompt for relevant underlying symptoms	Patient with higher acuity symptoms; Clinical knowledge	Check appropriate-ness of HA disposition		
12	Conflicting service goals (safety vs. efficiency)	Technology does not fit caller complaint due to complexity	Health Advisor knowledge	Complex (non-routine) call		Internal targets to minimize use of clinicians; conflicting goals (safety vs. efficiency)
13	Limited availability of urgent care at end of day; Demand on service	Call queue showing urgent callers	Patients with higher urgency calls	Clinicians required to do less urgent calls		Targets to meet wait times
14	Pandemic related pressures on external services	Technology not updated to match real world	Caller requires ambulance (lower urgency)			Organization protocol to provide of paper worsening advice in recognition of technology issues

components which pose threats to operating systems and require system adaptation. We believe the results depict a two-way relationship between technology and the wider work system. That is, technology can influence outcomes for callers, but wider system factors (e.g., availability of services, caller location) can also affect the usability of technology creating the need for adaptations (e.g., introducing an up-to-date paper crib sheet). Moreover, we support the sentiment elsewhere in this special issue (Saurin et al., 2024) that there are mixed implications of digital technologies and that humans will continue to play a central role in their implementation. For example, the current study described instances where humans were required to adapt the language of the script posed by digital technology where callers misunderstood, to proceed with triage. Additionally, novel technologies such as postcode finders and geocode systems supported call handlers to navigate through symptom assessments.

Using usability heuristics for good design, this study identified several phases and features of the technology which directly impacted workflow, creating a need for system adaptations. Some of these heuristics were influenced by the changes in the external environment, particularly the increase in demand from the COVID-19 pandemic (e.g., match between the system and the real world made information in the technical system redundant), whilst others have existed prior for some time in other telephone triage systems (e.g., the need for specificity when reporting addresses and symptoms). The most frequent and severe heuristic violation, 'match between system and the real world' corroborates previous criticisms that HIT software is not reflective of the ambiguous nature of illness and disease presentation but instead assumes a linear and serial relationship of symptom and disease or illness (Kushniruk et al., 2013; Morgan and Muskett, 2020; Murdoch et al., 2015). This led to workarounds like navigating the offline system where symptoms didn't 'fit' the CDSS. Health Advisors were previously found to use 'interpretive flexibility' (Turnbull et al., 2012) for similar reasons. There is therefore a case for investigating HIT usability in live environments, to observe 'work-as-done' as opposed to 'work-as-imagined'. Disconzi and Saurin (2022) in their paper outlining principles of resilience describe 'slack resources'. HIT designers could utilize the priority areas identified here to design in slack resources to better help the system function amidst operating challenges, for example, using machine learning algorithms to identify symptom patterns, or developing additional software to monitor which can monitor and react to the changing external environment to provide timely updates to ensure information about healthcare services is correct.

Both this, and a similar heuristic evaluation study in HealthDirect Australia (Tariq et al., 2017) identify common issues with the need for precision to operate the technology. Workarounds observed during the 'greeting and taking demographics' stage in NHS 111, echo problems encountered in HealthDirect Australia regarding 'flexibility and ease of use', where a match between the EHR and the patient was required by the software before an assessment could begin. Arguably, precise information is required for ambulances to be dispatched quickly in the event of escalating symptoms, highlighting potential challenges for HIT designers to optimize efficiency and safety. Issues arise when callers have atypical (e.g. caravans), temporary (e.g. hotels), or new addresses. The use of 'what3words' (a grid map which assigns a unique three-word code for every 3 m squared) as a workaround was observed in the pilot study, to overcome these challenges, and future research could investigate the facilitators and barriers to widespread implementation of such technologies, to improve system resilience.

Using SEIPS (Carayon et al., 2006) to analyze contributions of wider system factors to workaround behaviors demonstrated bidirectional relationships between technology and other system factors. For example, during the COVID-19 pandemic, a '111 First' protocol was introduced directing patients requiring A&E to call 111 prior to visiting. This created increased demand for the service, amidst decreasing availability of external healthcare services like ambulances (due to increased use and staffing shortages). Since the technology could not be updated quickly, information regarding waiting times and advice stored in the CDSS became inaccurate. To overcome this brittleness of technology, the organization placed paper advice sheets in the call center with more up-to-date advice reflective of the real-world situation. These types of dynamic, unpredictable changes in the external environment have been described in the literature as 'existential threats' requiring resilience (Fairbanks et al., 2014). Interested researchers and designers should consider work system factors which might affect the safety of HIT and respond to changes in the work system quickly. Additionally, this demonstrates the role organizations must play in embedding resilience procedures in line with 'work-as-done'.

Health advisors (HAs), despite being required to follow protocols and technology stringently, used workarounds, in response to many challenges from the work system. The workaround "HA ignored guidelines regarding the number of calls they may need to send to a clinician where they felt it was required" was influenced by five different work system factors including external performance targets, contributed to organizational pressures, presentation of a non-routine, complex problem, the reductionist design of the technology, and a lack of clinical qualifications. As a result, HAs felt they must refer callers to clinicians to be safe, despite not meeting their own (actual or perceived) efficiency targets. Of course, inefficiency can also create safety issues downstream, as demand increases, and this concern has been raised in recent research investigating the appropriateness of A&E referrals by NHS 111 (MacLellan et al., 2023). Those involved in the management of telephone triage call centers should consider all possible effects of imposed performance targets on safety and resilience.

A strength of the study is its tangible application. Perry and Fairbanks (2015) wrote hiding workarounds from managers is counter-productive and inhibits organizational learning and improvement. This study supports this notion by providing a case study to bridge 'work-as-imagined' and 'work-as-done' to make systems using HIT more resilient using observational and systems perspectives. Counter to the notion that technology might improve the balance between efficiency and resilience (Marques da Rosa et al., 2021), the study found organizational pressures to meet efficiency targets influenced technology use and negatively affected care quality. It also outlines workarounds which could be adopted as procedure to improve efficiency and safety in similar contexts, such as the issuing of paper worsening advice in absence of up-to-date technology, and training in responding to communication issues and safe medication practices. Improvement leaders in telephone triage systems and call centers can reflect on, implement, and evaluate workarounds identified here to improve resilience in similar systems.

6.1. Limitations

The main limitation of the current study is the small sample size, and lack of homeworkers involved, however the observation method contributed rich qualitative data for analysis and all observers were all familiar with the software. The analytical technique relies on a degree of subjectivity, but it is hoped the analysis of only field notes and use of clarifying questions has better captured "work-as-done" than simulated methods. The set of heuristics utilized here pre-date much of the systems thinking literature, but it is hoped the study provides a useful starting point to help HIT designers to direct their attention to improve these systems and that future studies could apply more up-to-date heuristics (e.g., Rayo, 2017).

6.2. Future research directions

Future studies could ascertain whether different workarounds are used by a home-worker population, and in out-of-hours, situations. Remote monitoring of employee workarounds using speech analytics, or key stroke analysis could achieve this whilst improving ecological validity. The reductionism of HIT design remains a challenge to be addressed to improve patient safety and solutions such as testing new technologies in live clinical settings, such as machine learning algorithms warrants further investigation.

7. Conclusions

This study highlights the systemic factors including technology usability on the need for adaptation to triage patients safely, amidst challenging operating conditions. It supports ideas that technology can both help and hinder system resilience and outlines priority areas of this NHS 111 telephone triage systems and processes meriting redesign. Several workarounds created by both non-clinical and clinical staff were identified which could be used to align procedures and training with "work-as-done". Methodologically, this study provides a case study for analyzing workflow to improve HIT systems in a realistic, pragmatic manner.

CRediT authorship contribution statement

Jill Poots: Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Jim Morgan:** Writing – review & editing, Supervision, Investigation, Formal analysis, Conceptualization. **Julie Woolf:** Writing – review & editing, Formal analysis. **Matteo Curcuruto:** Writing – review & editing, Supervision, Methodology.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: IC24 provided funding for travel costs to undertake this research. The third author is directly employed by the organization in which this research was undertaken.

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Appendices.

Appendix A. Full list of workarounds and system adaptation

Descriptions of workarounds observed	Frequency
Language is often altered from script, where a patient doesn't seem to understand, e.g., "brought up faeces" changed to "vomited poo". [Brought up rephrased in general]. Language had to be changed for "tenderness of spine" to "does your back hurt?". Question about "can you do all of your usual activities" was reworded to "could you watch TV to take your mind off it"? Reworded "mugful of blood" to "soak through towel". "See a GP within 3 working days" was changed to "I mean now - don't wait 3 working days"	6
HAs click check boxes before worsening advice is given	3
HAs click answers based on information and assumptions before caller responds to speed up process, e.g., clicking through module zero answers if the caller is collaborating - assuming they are fine. Similarly, dental pathway was completed in its entirety before answers were given by the caller - perhaps didn't felt it mattered as no availability.	3
Google was used to search for GP surgeries where callers didn't know the proper names.	2
Where there were signal problems (and therefore line was unclear), the HA read the number from the telephone equipment and repeated for confirmation. In this case, the HA waited for the phone number to be repeated before hitting "return"	1
Used a postcode finder website where the caller didn't know their postcode	1
Universal alphabet was used for difficulties capturing demographic information due to poor phonelines/strong accents.	1
The caller stated they were in a small car and holding the phone, so they couldn't administer self-tests (e.g., lifting arms above head) and therefore the HA had to tell them to change to speaker phone.	1
Use of offline version of CDSS to check possible pathways when in main pathways system. Also noted in heuristic violations ***HA described differences between the outcomes for the dizziness and palpitations pathways. The caller reported palpitations and dizziness. Dizziness asked for palpitations, but palpitations did not ask about dizziness. Outcomes were different (A&E vs 1 h speak to) depending on which pathway was chosen.	1
Had to ask a third-party caller to return to their parent's house for triage during a call-back (only next door, so was fine).	1
The problem of not altering others' notes is worked around by CA having to write in capital letters, but this is not standardised.	1
The clinical queue was navigated in such a way as to avoid "fines" from NHS England (unsure what the nature of fines is i.e. monetary or other penalties) by taking calls at risk of automatic dispatch over other calls; ignored other calls based on the assumption that callers will have gone to A&E anyway if following worsening advice	1
HA navigated two different pathways where symptoms were not linked (chest, then wrist) to see what the optimum outcome might be (home management vs urgent treatment centre in 4 h)	1
Some questions were skipped, e.g., a question about assault.	1
Since minor symptoms may not be life-threatening, but all calls go through Module 0, the statement "some questions might not be relevant" must be stated during every call	1
Questions were read from memory, before they appeared.	1
One mother who was driving was placed on hold while she got home - for safety and practicalities - the technology won't find a disposition if moving (Note: what are the implications of this if high acuity?)	1
When calculating toxicity, CA checked calculations twice to ensure they were correct (not standard protocol)	1
If there was no availability of a service, CA overrode the disposition and reported sometimes calling on behalf of a patient to check availability in services	1
NHS website was used for information about the causes and treatment of a rare illness	1
HA used google search engine to store knowledge (e.g., address) which would otherwise be stored in memory. E.g., Google search engine was used to write down notes while multi-tasking [manual dispatch for address which didn't exist in system] and for noting Senior Clinical Advisor number	1
CA stated they deviated from the queue in the case of 'pinked' calls even where this was not their assigned task, to speed up care	1
CA asked about underlying health problems though not prompted on screen to do so.	1
HA answered questions ahead of response, where the caller had already given them the information and they felt they had a view of the situation	1
Early exit selected when caller stated they had been on the other line to their GP and got an appointment - no option to state this in the software.	1
Due to ambulance having 36 h wait, callers were directed to take taxis or other forms of transport. One caller stated they would have to borrow money from someone to be able to go to A&E themselves, or outcome was changed to GP	1
DOS - not always selecting first option appears - select the service which is most suitable - commissioners profile DOS - services ought to be utilized in priority order	1
DOS - CPCS (Pharmacies consultation) not selected as there are known issues so reluctant to use - lots of patients call back due to issue - rather than raise issues and are reluctant to use again.	1
COVID advice was given from memory, as opposed to reading, due to familiarity with material.	1
Clinician identified 4 pathways used by HA as patient refused disposition. Either they used the system to get what patient wants or haven't covered symptoms due to a complex call, which was potentially unsafe.	1
Clinician asked whether the caller had a smartwatch or could take their own pulse to get heartrate	1
HA ignored guidelines regarding the number of calls they may send to a clinician where they felt it was required.	1
CAs overrided ambulance dispositions due to delays and directed patients to A&E instead	1
Care home protocols are to call 111 for things like medication issues or permission to lift someone off the floor who had fallen	0
Call back for 999: caller was referred back to 999 since there was no way of knowing where in the 999 system the call was, and reassessment may lead to lower urgency anyway	1
CAs reported deviating from system and basing their decisions on time, e.g., at 4pm was more likely to choose A&E disposition to ensure care received.	1
CA reported keeping a call "open" until OOH starts if it was close to 6pm and a GP disposition was likely for callers of concern, to ensure they were seen that day	1
HA didn't give time for GP even though had booked a call-back at 3pm. Stated they weren't allowed to give a time as it doesn't necessarily match what the GP may have available due to emergencies	1
CA deviated from the pathways questions to personalise discussions e.g., "what type of dogs do you have" which was more natural than HA conversations which focused solely on pathways	1
Ambulance validation message does not pop up - workaround. System hasn't been updated to incorporate lengthy delays in ambulance therefore cribsheet provided on desk for worsening advice for CAT3/A&E.	3
At midday, Clinician reported still making call backs from the previous night and therefore had to apologise to all callers at the start of the call.	1
Asked for informal advice in the contact centre, as opposed to using the formal advice lines; received different advice re: safeguarding of hospital inpatient (yes/no) from the Clinical Advice Line	1

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