Adopting a human factors approach to improve safety in the emergency department

Richard Brownhill[1], Clare Carr[2]

[1] NHS England, UK, [2] East Suffolk and North Essex NHS foundation Trust (Ipswich site), UK

SUMMARY

Emergency departments across the country are experiencing high levels of demand and occupancy leading to crowding, creating an environment where those working in at find it difficult to function at their optimum level. The performance influencing factors for these staff impact in a number of ways leading to high cognitive load, stress and a sense of hoping to get through the shift without patients experiencing adverse events.

The emergency care improvement support team (ECIST) is part of NHS England's operational improvement arm, working with healthcare systems to develop understanding and improvement across the urgent and emergency care (UEC) pathway. A team within the emergency department at Ipswich hospital recognised that the acuity of patients walking into their service appeared to be increasing and the number of those unexpectedly deteriorating was increasing. As ECIST was already working with the organisation in relation to their UEC pathways, an approach commenced to understand further the work-as-done in relation to this safety critical area of hospital care. The improvement led to an improvement in perceived safety and speed of intervention for patients with sepsis.

KEYWORDS

Emergency department, initial assessment, sepsis, improvement, SEIPS

Introduction

Emergency departments across the country continue to experience high levels of demand and occupancy leading to crowding and an environment that is difficult for staff to function at their optimum level. Compounding the problem is the delays in ambulance response times that prompt more patients to make their own way to hospital, resulting in more unwell patients walking in through the emergency department front door. A combination of greater attendances, higher acuity and pressured working conditions are associated with increased risks of patient harm (Jones et al 2022). The use of historical safety controls may no longer prove to be effective. The team at Ipswich hospital (and seen more widely across the country) found that a higher proportion of unwell patients were sitting in the waiting room, and there was a greater sense that people were deteriorating more unexpectedly than previously.

To improve flow across the hospital (potentially improving ED crowding), the Trust organised a collaborative event, known as a Super Week. This brought teams together with the expectation of dynamic working on problem solving, testing, and improving aspects of their hospital flow. As part of this, the team invited the emergency care improvement support team (ECIST) to assist as they

had experienced some helpful insights and collaboration from them previously. ECIST are a clinically led team, part of NHS England's operational improvement team. Their role is to provide guidance, support, and advice on good practice across the urgent and emergency care pathway. Rather than using traditional improvement approaches, a human factors/ergonomics (HF/E)approach was taken to promote recognition of complexity, multiple perspectives, and potential for design around what really happens (so called work-as-done). Healthcare as a complex socio-technical system is increasingly being encouraged to adopt HF/E approaches to examine patient safety (NHS England 2022).

Working with the team to understand a series of inputs, observation data and how patients experience this perspective culminated in a workshop in February 2023 to address opportunities for improvement.

Methods and approach

An observation exercise was undertaken in the waiting room one afternoon, to watch what happened from when a patient walked in, to when they were formally assessed (known locally as the triage process). This allowed the multiple tasks, variety of staff and patients people, wayfinding, and the context of the physical environment to be considered. The noise, temperature, lighting, comfort, workload demands (queue), and the way tasks were being completed, all contributed to the rich and obviously busy experience of the emergency department waiting room. A patient Mr B was observed walking in and commented on how amazing the hospital was. Mr B was observed through his initial assessment, booking in and formal assessment process. As he went through the different areas, staff were then asked to comment on what tasks they were undertaking at the various stages of the process. The observation finished following Mr B's formal assessment. Staff will typically undertake 20-30 of these assessments within the course of their shift.

After local data including some metrics and observations were collated, these were used as a basis for discussion and then combined with the SEIPS (systems engineering in patient safety) method to share thinking, perspectives and understanding around the safety of the current process. Carayon et al (2006). The overall approaches are outlined in table 1 below.

Table 1: Approaches

Method	Purpose	Reference
Observation of patient journey	Examine the patient journey from walking into the ED to formal assessment	B1465-Observations-v1-FINAL.pdf (england.nhs.uk)
Available local data	Using some measures which help to consider operational performance	SEDIT - Getting It Right First Time - GIRFT
Walk-through-talk-through	To understand how staff understand, experience, and undertake initial assessment as an approach	WTTT-Guide-Leaflet-Rev01.pdf (hpog.org)
SEIPS workshop	To use a recognised human factors approach to apply systems thinking, understand complexities and interdependencies to assess risks and improvement opportunities	Holden, R.J.et al 2013. SEIPS 2.0: a human factors framework for studying and improving the work of healthcare professionals and patients. *Ergonomics*, *56*(11), pp.1669-1686.

Findings

Observation

The layout of the emergency department waiting room and the path for patients walking in through the door, speaking to a clinical streamer, registration at the reception desk and then the clinical priority being formally assessed and documented by staff (Figure 1). Mr B was followed, and is represented by a red dot, on his journey through this process and the times each of these tasks were completed. This took 98 minutes from walking in; the national standard is 15 minutes.

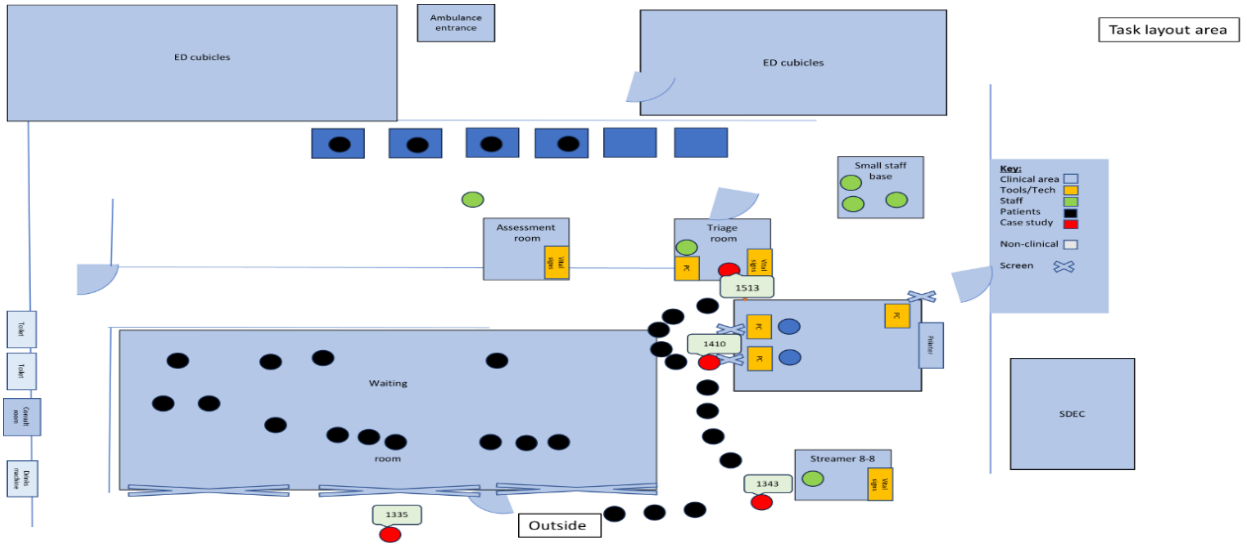

Figure 1: Emergency department layout.

Data

The national standard to record time to initial patient assessment is 15 minutes, aimed at early recognition of a potentially deteriorating patient. Locally this was being achieved in 41.8% of cases. The capacity to manage this incoming demand was generally one nurse, meaning that 60 minutes per hour of time was available to conduct the task. When observed and measured this task took 11 minutes per patient (median) meaning that around 5 patients an hour could be assessed without a queue occurring. As the demand exceeded the capacity, the task could be shortened through less dialogue, parts of the process being left incomplete, and/or high levels of cognitive demand placed on the individual nurse. When a queue forms, one local mitigation is to deploy a second nurse, though this person is not always available, meaning that we may believe we have an effective response but in practice, this is not an effective control. As seen below in figure 2, the demand (pink area) outweighs the current capacity, posing delay to the assessment task.

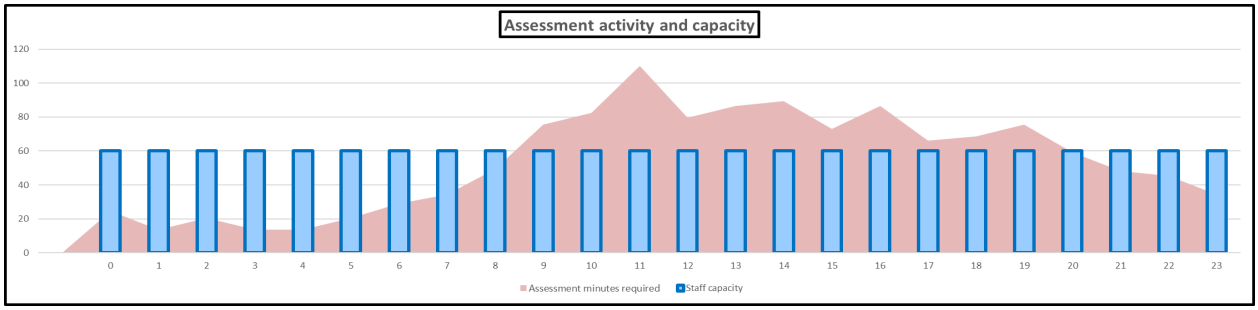

Figure 2: Hourly registered nurse staffing capacity compared with hourly assessment demand.

Walk-through-talk-through

The initial streaming process is variable and doesn't run at night and involves no documentation or consistent recording of vital signs. The demand for one receptionist on the day, meant that there was a long queue to await registration. The demand for one nurse also meant that there was a delay to be assessed despite staff working hard to keep up.

There was a lack of clarity about who was responsible for overseeing patients sitting in the waiting room, streamer, or ED assessment nurse. The ED nurse temporarily takes patients into a room to assess, meaning ongoing monitoring of sitting patients is sporadic, potentially limiting opportunities to spot deterioration. Once assessed, information is recorded on a paper-based system, meaning that the patient's priority status and the acuity of the total number of patients in the ED is not visible. In the traditionally, sicker end of the ED, a manual white board is used to record status at a glance improving some visibility of this cohort of patients. Staff were moved flexibly around the department to meet changes in priority in response to the clinicians in charge. Whilst this seems logical, there was a high workload demand and levels of over occupancy, meaning that it was more difficult to manage easily within the physical environment. This led to an area where a group of patients with mixed needs, was constantly turning over. This resulted in task switching, some risks of identification and tracking of patients in their pathway, as well as evident high cognitive load on the team.

SEIPS workshop

A 2-hour workshop was well attended and involved over 20 members of the multidisciplinary ED team, keen to join and add their perspectives.

The data and observations from 'walk-through-talk-through' were presented to share a perspective that allowed a demonstration of what actually occurred when following a patient through. This generated lots of discussion, and the team began to speak, discuss and debate their experiences collectively. To help frame thinking, we started to work through the different domains within the SEIPS framework to guide the scope around the task of initial assessment.

Using SEIPS, a tool as a tool to collate what people found to be key features of the various domains, discussions continued, and insights were developed. Several features emerged:

- A difference between work-as-described and work-as-done
- A significant delay in patients getting to the first definitive assessment.
- A paper method of recording the patient's acuity (sickness) level which meant that safety oversight was difficult. `
- Significant differences in how the team described how the process should be and how they conducted it.
- A lack of opportunity/forum for members of the team to share what they were doing adaptively on a shift.
- Significant variation between shifts and teams

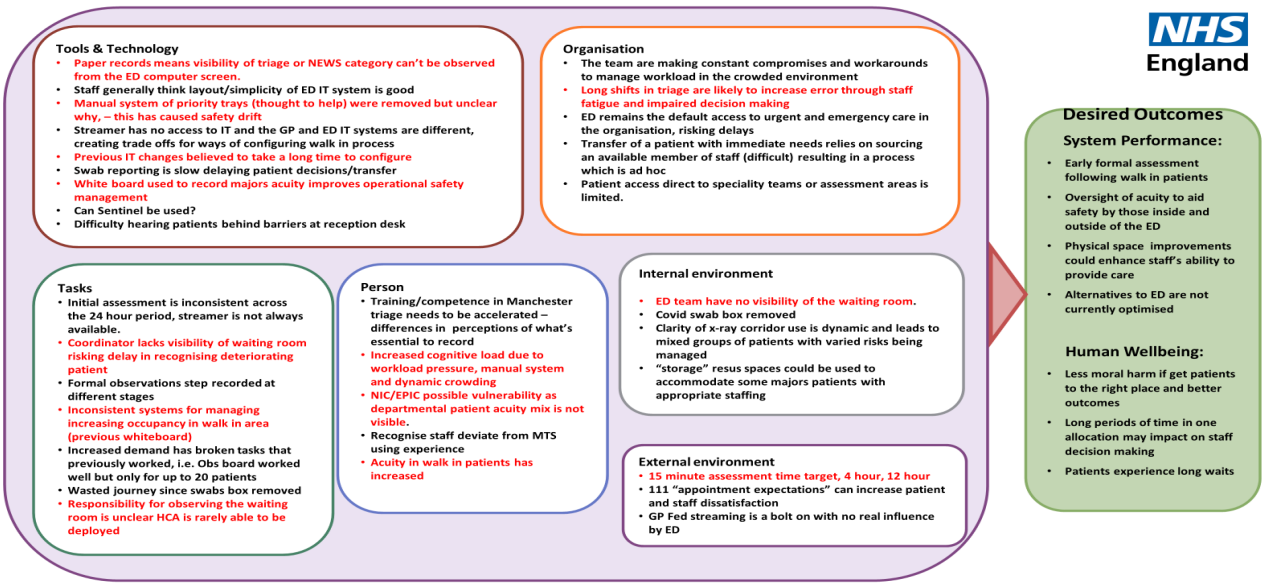

Figure 3: Summary of SEIPS domains from the original workshop

ED team engagement to designing improvements

The team developed an improvement plan, to help redesign their current approach and improve safety. This involved a series of steps, in particular developing closer working with the IT team to create an electronic system that provided a stronger visibility of patient status at a glance.

The team took the emergent themes following the ECIST workshop to their scheduled senior nurse meeting, intending to discuss and develop further. The team agreed that some safety priorities and a review of roles and responsibilities was necessary to really tackle the complex issue of assessment. A multi-professional, multidisciplinary discussion then took place and the senior nursing team facilitated group work to crystallise thoughts and ideas into some workable, testable prototypes. This included wider system partners, to be able to share perspectives and check and challenge thinking, with the intention of agreeing some core task principles.

The frequent modifications to how services are being run on a day-to-day basis, may/may not be updated in a standard operating procedure (work-as-described) and doesn't reflect the complexity of the task (work-as-done). This gap creates the need for trade-offs to be able to adapt to the conditions that the staff really experience. This phenomenon is widely acknowledged within human factors and patient safety (Hollnagel 2014), meaning those delivering the task need to be heavily involved in the design of it. Within healthcare settings this is often left to operational or clinical leads and not necessarily those who actually carry out the work, this can reflect varying degrees of stakeholder involvement.

Within the SEIPS workshop, the case example focussed on a walk-in patient presenting with moderate illness, the team now extended their thinking more inclusively to consider the wider range of patients being seen. A high volume of patients present with minor injuries and those conducting this work had largely been recipients of an operationally designed process not an inclusive designed process. Through this focus on initial assessment, the minor injuries team were convened to develop and share understanding of their work. There was a realisation that the whole team had not formally been convened as a group for several years! This is not an uncommon phenomenon as many urgent and emergency care facilities have now been segmented, so whilst their management tier may meet,

those conducting the daily clinical work may not have had the opportunity to do so. As highlighted by Antle and Miller (2017), its essential to have frontline workers to help others understand the work and inform strategy and policy.

The injuries team highlighted concerns that patients waited longer than expected to receive pain relief as the existing process meant that, they would be streamed at the earliest possible opportunity to their service. Patients would then be seen in time order and the administration of pain relief was at a patient's request rather than designed as a proactive step in the process. Staff members worked in consulting rooms, meaning that when new patients arrived in the minor injuries area, it was not obvious and the opportunity to enquire about pain relief less likely to be enacted.

This started to generate the need for wider data inputs to inform further thinking aiding discussions about potential benefits, risks, and measures to track.

Table 2: Data collection inputs to inform task requirements

Patient acuity and dependency	Already collected
Hourly patient occupancy and demand	Not already collected
Measurement of assessment process times	Not already collected
SEPSIS measurement	Already collected
Patient feedback	Already collected
Staff feedback	Already collected

Actions identified and progressed

- A review of alignment of staff allocations to tasks based on patient acuity and demand
- A clear focus on the form and function of the assessment process design
- A focus on improving safety and responsiveness across the emergency care pathway
- Co-design of some IT changes to aid workflow and heighten visibility/situational awareness
- A realisation that assessment and treatment of sepsis was integral to the design requirements
- Improvements were needed in early administration of analgesia to patients who need it
- A stronger role for patient feedback in driving design
- The need for more training and development to equip nurses to deliver broader care

Outcomes

Following a series of ongoing actions discussions and communications, the team redesigned their ED assessment process. This has fostered a stronger sense of safety, through co-design, shared thinking, and stronger controls. Delivering patient care in the emergency department remains intense and at times produces high cognitive load for staff. Through improvements and redesign some fears, concerns and trade-offs have been addressed (e.g. minor injury patients receive medication at the primary assessment stage). The use of an acuity/dependency tool meant that additional nursing staff were able to be agreed and funded to support the model.

Waiting room based assessment.

The team introduced a workstation on wheels in the main waiting room, where formal triage assessment could be conducted. This provides direct clinical oversight of patients arriving and sitting in the waiting room to reduce the risk of unnoticed patient deterioration as well as providing visible reassurance to patients.

The minor injury patient pathway redesign meant that there is greater consistency across how patient groups are dealt with and that formal documentation of their priority provides visibility of patient acuity. A healthcare support worker (HCSW) also works with the registered nurses to conduct to repeat physiological measurements to allow monitoring of a patients ongoing status.

Figure 4: New workstation

This has particularly helped when there are high volumes of patients waiting for prolonged periods to provide a control for detection of deterioration. The HCSW aims to provide two-hourly review to consider pain levels, communicate any information and address nutrition/hydration needs where appropriate.

An intense programme of development was provided to produce more triage trained nurses to conduct initial assessment. The greater the volume of staff trained, the easier it became to fulfil rotation of roles on a shift the intention to reduce fatigue and potentially the risk of error.

As part of the new process, newly configured co-designed (with IT) columns on the patient administration system screen, meant that the recording of patient acuity could be entered onto the electronic system along with the prioritisation category. This meant that anyone accessing the system could see at-a-glance the volume, priority, and physiological acuity measure of all patients. This underpins the ability to conduct ongoing dynamic departmental risk assessments using clear triggers, a critical function within modern busy emergency departments.

Sepsis pathway enhancements

Due to demand matching, further training and redesign in the assessment process, the ability to recognise and instigate treatment for sepsis (a potentially life-threatening condition) was realised.

All senior nurses were trained in the instigation of sepsis treatment and through enhanced good work design, the task made easier. Medications were made more accessible through the introduction of sepsis specific trolleys where equipment was held in one place and could be wheeled to the patient.

Figure 5: mobile sepsis trolley

An overall improvement in measured sepsis compliance has been observed following the introduction of these changes (Table 3). The workshop was held in February 2023 and subsequent changes/improvements following this.

Table 3 sepsis data

Sepsis screening and treatment compliance - Ipswich ED	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23
Triage obs taken within 15 minutes of arrival to ED	64%	54%	83%	76%	66%	59%	87%	72%	82%	74%	85%	64%
NEWS ≥5 or 3 in 1 parameter and was the patient screened?	82%	88%	78%	94%	91%	84%	93%	98%	100%	92%	83%	98%
Sepsis 6 documentation completed?	44%	66%	77%	78%	63%	90%	90%	90%	94%	76%	82%	85%
Compliance with all 6 elements for RF	18%	24%	50%	52%	66%	70%	87%	65%	83%	58%	68%	80%
Compliance with IV abx within 1 hour for RF	71%	58%	77%	93%	87%	85%	92%	87%	94%	87%	86%	91%
Compliance with IV Fluids administered within 1 hr	91%	89%	96%	85%	92%	95%	97%	87%	94%	91%	79%	96%
Compliance with high Flow O2 delivered	94%	100%	100%	96%	97%	95%	100%	97%	100%	96%	100%	100%
Compliance within the hr IV Abx, fluid & O2	65%	55%	77%	81%	87%	85%	92%	84%	94%	82%	71%	89%
Compliance with cultures taken within 1 hour	88%	79%	92%	89%	95%	95%	97%	97%	100%	91%	93%	98%
Compliance with lactate measured within 1 hour	88%	89%	96%	96%	97%	90%	97%	97%	100%	91%	100%	98%
Compliance with fluid balance chart within 1 hour	32%	34%	58%	63%	66%	85%	87%	74%	83%	69%	96%	87%

Conclusion

Prior to the changes, there are examples of patients waiting several hours for ambulances to respond to calls, leading to families taking their unwell loved ones to hospital in a car. In some cases, coupled with existing long waits to be seen and a busy waiting room, sometimes significant time has elapsed until a formal recording of the patient's priority and instigation of treatment.

A recent letter received from the mum of a teenager highlights, "I just wanted to feedback that every member of staff involved in my son's care were absolutely fantastic. From the receptionist and triage nurse, who helped prioritise my son's care, the HCA taking observations in the waiting area who, when I raised I was worried his condition was changing monitored and updated the doctors to prioritise his care"… , "in spite of the department being extremely busy which must be a real juggle of priorities".

Whilst the team have worked hard to address improvements in the national expected assessment time of 15 mins post arrival, the national SEDIT data suggests that the percentage of patients seen within 15 minutes remains around the same as the national average at 50%. There is however improved visibility and oversight in the waiting room as well as some other positive indications.

As safety is emergent, a single indicator is unable to define an ideal or perfect system, though both patient and staff benefits have been derived through stronger co-design and increased presence of patient monitoring. The team will continue their improvement journey.

References

Antle, D.M and Miller, L.L cited in Shorrock, S and Williams, C (2017). Human factors and ergonomics in practice

Carayon, P.A.S.H., Hundt, A.S., Karsh, B.T., Gurses, A.P., Alvarado, C.J., Smith, M. and Brennan, P.F., (2006). Work system design for patient safety: the SEIPS model. *BMJ Quality & Safety*, *15*(suppl 1), pp.i50-i58.

Getting It Right First Time (GIRFT) available online at:
SEDIT - Getting It Right First Time - GIRFT [accessed 15/01/2024]

Holden, R.J.et al 2013. SEIPS 2.0: a human factors framework for studying and improving the work of healthcare professionals and patients. *Ergonomics*, *56*(11), pp.1669-1686.

Hollnagel, E. (2014) Safety-I and Safety-II: the past and future of safety management. CRC press.

Jones, S., Moulton, C., Swift, S., Molyneux, P., Black, S., Mason, N., Oakley, R. and Mann, C.,

(2022). Association between delays to patient admission from the emergency department and all-cause 30-day mortality. *Emergency Medicine Journal*, 39(3), pp.168-173.

NHS England (2022) available online at
B1465-Observations-v1-FINAL.pdf (england.nhs.uk) [accessed 15/02/2024]

NHS England (2022) available online at:
https://www.england.nhs.uk/wp-content/uploads/2022/08/B1465-1.-PSIRF-v1-FINAL.pdf:
[accessed on 12/12/2023].