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Enhancing safety in mental health hospitals: a multi-site evaluation of a contactless patient monitoring platform

Maria Kekic, Adam Rose and Daniel Bayley
LIO, Abingdon, UK

Abstract

Purpose – There is growing interest in how data and technology can improve safety in mental health hospitals. A contactless patient monitoring platform, implemented in half of NHS England mental health trusts, has shown promise in single-site studies. This paper aims to evaluate the platform's impact on safety outcomes across multiple sites.

Design/methodology/approach – Previously collected data from 29 adult inpatient wards – spanning acute, older adult and psychiatric intensive care services – at six NHS trusts were consolidated. Event rates were compared before and after the platform's deployment, with control wards included where possible. Outcomes reflected key safety risks for each care pathway: self-harm on acute wards; falls on older adult wards; and assaults, physical restraints and rapid tranquillisation in psychiatric intensive care units. Meta-analyses for each outcome combined data from all eligible wards.

Findings – Results varied by ward but most showed decreases in event rates following adoption of the monitoring platform. Meta-analyses indicated notable reductions across all five outcome measures, ranging from −21.1% to −38.9%.

Research limitations/implications – Analyses were limited by factors such as variable data quality and analytical control, and by the absence of patient and staff perspectives. Nonetheless, findings suggest that the monitoring platform can assist staff in managing diverse safety risks and that wider rollout could contribute to national safety improvement initiatives. Its success will depend on responsible, ethically-informed implementation and use.

Originality/value – To our knowledge, this is the first evaluation of a contactless patient monitoring platform across multiple mental health care facilities and service types.

Keywords Patient safety, Inpatient mental health, Psychiatry, Technology, Contactless monitoring, Observation, Incidents, Self-harm, Falls, Assaults, Restraint, Restrictive practice

Paper type Research paper

Conflict of interest: The authors disclose that they are employees of Oxehealth Limited (trading as LIO), which developed the technology discussed in this publication. As such, the authors have a financial interest in the success of this product. Steps have been taken to ensure that the research presented here is unbiased and scientifically rigorous. The results reported are based on objective analysis and interpretation of the data. The lived experience commentary was contributed independently by an individual not employed by Oxehealth Limited (trading as LIO).

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Introduction

Inpatient psychiatric services are intended to be safe environments where individuals in acute phases of mental illness, whose needs cannot be met in the community, can access therapeutic support. However, there are longstanding concerns about safety in mental health hospitals in the UK and internationally (Care Quality Commission, 2024).

NHS England (n.d.) defines patient safety incidents as "any unintended or unexpected incidents which could have, or did, lead to harm for one or more patients receiving healthcare". While many safety risks in general healthcare (e.g. medication errors) also impact inpatient mental health care, patients in psychiatric wards encounter additional, unique adverse events (Thibaut *et al.*, 2019). In the year to April 2022, over 300,000 patient safety incidents were reported across NHS mental health trusts in England (NHS England, 2022a). Self-harm was the most commonly occurring incident type, accounting for a third of all cases, followed by disruptive or aggressive behaviour, and patient accidents including falls (NHS England, 2022a). Restraint is not formally categorised as a patient safety incident but staff are required to document when it has been used. In July 2023 alone, over 8,000 incidents of restrictive intervention were reported across NHS England mental health services (NHS Digital, 2023). The total number of restraints that month exceeded 12,000, as many incidents involved more than one type of restraint (NHS Digital, 2023).

Although serious patient safety incidents are rare, they can result in severe physical injury or even death (NHS England, 2022a), as can the practice of restraint (Mohr *et al.*, 2003). Most incidents are deemed to cause no or low harm (NHS England, 2022b), but these events can still evoke intense emotional reactions in patients, their families and mental health practitioners. Patient safety incidents can also disrupt hospital operations, interfere with the functioning of wards and place a significant economic burden on healthcare systems (Tsiachristas *et al.*, 2017).

Like in other safety-critical industries, factors contributing to safety incidents in mental health care are complex and multifaceted. Beyond patient- and provider-related factors (for a summary, see Cuomo *et al.*, 2021), systemic issues such as staffing shortages, high levels of bed occupancy, ageing infrastructure and poorly-designed facilities can compromise safety in psychiatric hospitals (Care Quality Commission, 2024). Clinical practices used to manage risk have remained largely unchanged for decades despite evolving demands. For instance, manual patient observation is adopted as part of the standard of care across the NHS, but it can negatively impact patient experience and there is limited evidence of its effectiveness in preventing safety events (Bowers and Park, 2001; Chu, 2016; Veale *et al.*, 2020).

The current state of psychiatric inpatient care has attracted media, political and public attention, with widespread consensus on the need to raise safety standards. Data and technology are increasingly seen as essential in achieving this (Department of Health and Social Care, 2024a, 2024b; NHS England, 2023). Electronic patient record systems are an early example of digital transformation in mental health services. These systems were introduced globally to improve the collection, sharing and use of healthcare information, with the promise of safer and higher-quality care (Kariotis *et al.*, 2022). Digital observation tools offer another avenue to reduce paperwork and streamline workflows, while enhancing auditability and the quality of observations. Targeted solutions have also been adopted to mitigate specific risks; for example, anti-ligature door sensors and fall detection devices (Tanwar *et al.*, 2022). More recently, artificial intelligence has started to play a role in relation to diagnostic precision and personalised therapy (Mukta *et al.*, 2025). These developments indicate progress in the use of technology to support a historically under-served clinical area, though challenges remain including interoperability gaps and limited real-world evidence.

One area with vast potential for digital aids to enhance safety outcomes is patient monitoring. On general hospital wards, continuous vital sign monitoring has been shown to improve the detection of patient deterioration, increase time available for patient care, and strengthen perceptions of overall patient safety and care quality (Pavithra *et al.*, 2024; Stellpflug *et al.*, 2021). Digital patient monitoring tools designed for use in inpatient mental health settings are also becoming more widely used.

Half [1] of NHS mental health trusts have implemented a contactless patient monitoring platform to support the delivery of care on their inpatient wards (developed by Oxehealth Limited, trading as LIO; referred to as "the monitoring platform" for the rest of this paper). The monitoring platform integrates camera-based hardware, which is securely wall-mounted in a patient's bedroom, with specialised software, including regulated medical device software for vital signs and sleep measurement (Lloyd-Jukes *et al.*, 2021). Using portable tablets or fixed screens in the nursing station, staff can measure a resting or sleeping patient's pulse and breathing rate without entering their room. Staff also receive alerts if high-risk patient activity is detected, prompting proactive intervention where appropriate, and the platform generates reports on vital sign, sleep and activity trends to inform clinical decision-making and care planning. To safeguard patient privacy and confidentiality, the monitoring platform does not record sound, video images available during and directly after an alert are blurred, and staff can only access a clear view into the room (which is a required element of standard in-person observation protocol) for up to 15 seconds when measuring pulse and breathing rate. In addition, the monitoring platform employs data encryption and strict access controls, including user authentication, role-based permissions and audit trails.

The monitoring platform's value has been demonstrated in multiple mental health inpatient settings. Previous studies show reductions in self-harm (Ndebele *et al.*, 2023) and sleep disturbance (Barrera *et al.*, 2020) on acute psychiatric wards, decreased assaults and use of rapid tranquillisation in a psychiatric intensive care unit (PICU), fewer falls and avoidable 1:1 observations on dementia wards (Wright and Singh, 2022), and improved physical health monitoring in seclusion (Clark *et al.*, 2022). The technology has also been associated with time and cost savings for acute, older adult and PICU care pathways (Buckley *et al.*, 2024; Malcolm *et al.*, 2022a; Malcolm *et al.*, 2022b). Here, we build on this existing research by examining the monitoring platform's impact on safety in a multi-site analysis. Specifically, we investigated whether integrating the monitoring platform into routine clinical practice at six NHS mental health trusts led to lower rates of safety events: self-harm on acute mental health wards, falls on older adult wards, and assaults and restraints in PICUs.

Methods

The authors of this publication are employees of Oxehealth Limited (trading as LIO), the developer of the technology evaluated. Appropriate measures were taken to ensure objectivity and methodological integrity. The lived experience commentary was contributed independently by an individual not employed by the company.

Design

This paper presents a secondary retrospective analysis of data from a series of evaluations, conducted between January 2018 and March 2022, across six NHS mental health trusts spanning multiple regions in England. These evaluations assessed whether adopting the monitoring platform was associated with changes in key patient safety outcomes in adult inpatient mental health services.

Each used a before-and-after design, comparing incident rates prior to and following the deployment of the technology. Control wards were included where possible, guided by trusts' clinical recommendations. This was only achievable for acute wards, primarily

because they are typically more numerous within a trust than older adult wards and PICUs. Validation criteria for control wards were: similarities in patient demographics (e.g. gender, clinical diagnoses); ward size; ward layout (e.g. presence of ensuite bathrooms); clinical practices; average patient length of stay; and incident rates.

In total, 29 intervention wards (12 acute, 7 older adult, 10 PICU) were assessed across the six trusts (see Appendix A; Table A1). Two additional wards using the monitoring platform were excluded from the analyses: one acute ward (male, Trust A) was not included because only a single self-harm incident was recorded across the evaluation periods (this occurred in the pre-implementation period); and one older adult ward (mixed gender, Trust F) was not included because of a significant policy change related to discharge, which affected the demographics and turnover of the patients.

Evaluation periods varied by trust and by ward due to differences in monitoring platform rollout timelines and the availability of data from each trust. Outcome selection for each ward was determined by the primary safety concern(s) associated with its care pathway and by its incident reporting protocols (see Data collection for further information).

Patient characteristics and ethical considerations

This work involved inpatient mental health wards for adults aged 18 years or older. Actual patient numbers are not available because individuals without recorded incidents do not appear in the data. However, it is estimated that more than 9,800 patients were treated on intervention and control wards during the evaluation periods (calculated by dividing total occupied bed days by average length of stay). Table A2 in Appendix A shows the distribution of the most common diagnoses among patients, categorised by service type.

Trust A received ethical approval from Wales Research Ethics Committee 5 (17/WA/0193) (Ndebele *et al.*, 2023; Ndebele *et al.*, 2022). Consent to use the monitoring platform in each patient's bedroom was obtained either from the patient themselves or, where they lacked capacity, from a designated decision-maker. Trusts B–F carried out service evaluations as part of routine service monitoring and quality improvement activities, and implemented an implicit consent model in line with national guidelines (National Mental Health and Learning Disability Nurse Directors Forum, 2022). Under this model, the platform is adopted as part of standard clinical practice on the ward and clear, transparent information is shared with patients and carers on admission.

The multi-site evaluation presented here draws on de-identified data routinely collected as part of standard incident reporting. All necessary permissions were granted for its analysis.

Data collection

Pseudonymised data from NHS incident reports were analysed to quantify key safety events during the pre- and post-implementation periods on wards under evaluation. Data were gathered for all patients on the ward regardless of whether the monitoring platform was active in every bedroom. Table 1 outlines the specific outcome measure(s) assessed for each service type, selected to address the major safety concern(s) for each care pathway (Cullen *et al.*, 2018; Healey *et al.*, 2008; James *et al.*, 2012; Mind, 2015). Restraint data were categorised into physical restraints and chemical restraints (i.e. rapid tranquillisation) to allow for a more detailed analysis. For PICUs, data on the three relevant outcomes (assault, physical restraint and rapid tranquillisation) were not consistently available across all wards.

Self-harm incidents and falls were counted only if they occurred in the patient's bedroom or ensuite bathroom, reflecting the monitoring platform's direct role in mitigating these events in those areas. In contrast, assaults and restraints were recorded regardless of location on the ward, as they rarely occur in bedrooms and their reduction is linked to broader

Table 1. Outcome measures

Safety event	Location of event	Care pathway	No. of trusts	No. of intervention wards
Self-harm	Bedroom, including ensuite bathroom	Acute mental health	5	12
Fall	Bedroom, including ensuite bathroom	Older adult mental health	3	7[a]
Assault[b]	Anywhere on the ward, including bedroom and ensuite bathroom	PICU	6	10
Restraint – physical	Anywhere on the ward, including bedroom and ensuite bathroom	PICU	3	4
Restraint – rapid tranquillisation	Anywhere on the ward, including bedroom and ensuite bathroom	PICU	4	5[a]

Note(s): PICU = psychiatric intensive care unit. [a]Due to low incident rates, two of these wards were combined and treated as a single ward for the data analyses. [b]Includes both patient-to-patient and patient-to-staff assaults
Source(s): Authors' own work

mechanisms. The mechanisms underlying the monitoring platform's impact are explored in greater detail in the Discussion.

Data from Trust A are also published elsewhere in single-site evaluations (Ndebele *et al.*, 2023; Ndebele *et al.*, 2022; Wright and Singh, 2022)[2]. A multi-site evaluation of self-harm data from Trusts A-D was previously published but later retracted due to the accidental omission of a conflict of interest statement (Kekic *et al.*, 2024).

Data analysis

Data were analysed using Python 3.10 (Python Software Foundation, USA). Safety event rates were calculated as the number of events occurring per 1,000 occupied bed days. Change in event rate was computed for each outcome and for each ward. The formula used was:

$$A_1/A_0$$

where *1* and *0* denote the post- and pre-implementation periods, respectively. For rates of self-harm at Trusts A–D, relative risk was also calculated due to the availability of control wards. The formula used was:

$$\frac{A_1/A_0}{C_1/C_0}$$

where *A* and *C* refer to intervention wards and control groups, respectively, and *1* and *0* refer to post- and pre-implementation periods, respectively.

Outlier analysis was conducted to identify patients within each trust who had a safety event rate per day that was markedly higher than that of the typical patient cohort. Outliers were found exclusively in acute settings for self-harm incidents. Patients were excluded if ward managers or matrons believed that an alternative care pathway, typically a PICU, would have been more suitable for their specific needs ($n = 15$).

Standard deviations and confidence intervals were calculated using the basic bootstrap method (also known as reverse percentile interval; equation 5.6, Davison and Hinkley, 1997),

applied to the logarithms of the change ratios, with resampling over patients to ensure that variations in inter-patient incident rates were accounted for. This resampling method assumes equal likelihood for each patient, regardless of their number of safety events, ensuring that a 50-event patient has the same chance of being sampled twice as a 3-event patient, hypothetically. This approach was chosen because it accommodates the volatility of inpatient mental health populations and the limited availability of complete demographic data.

Fixed-effect meta-analyses were conducted for each outcome measure using the inverse-variance weighting method, analysing the logarithms of the change ratio statistics from all relevant wards. For the self-harm outcome, the logarithm of the relative risk statistics was analysed instead, as control ward data were available for the majority of acute wards. Inverse-variance weighting was used to give greater weight to wards with lower variance, and less to those with higher variance, in the combined figures.

All change statistics are presented as percentage changes for ease of interpretation. Because the analyses were based on real-world evaluations rather than randomised controlled trials, the findings indicate associations, not causal effects.

Results

Self-harm incidents on acute mental health wards

Self-harm data were collected from 12 acute mental health wards and 11 control wards at five NHS mental health trusts (Trusts A–E). Across these 23 wards, staff reported a total of 2,796 bedroom self-harm incidents during the pre- and post-implementation periods. Table B1 in Appendix B summarises the findings for this outcome measure. A corresponding table with outliers included is also available (Table B2; there are no notable differences compared to the analysis with outliers excluded).

For Trusts A–D, which had control groups, both increases and decreases in self-harm incident rates were observed across the seven intervention wards from the pre- to the post-implementation period (range: −53.4% to 58.0%). The same was true for the six control wards (range: −31.5% to 275.1%). When the change in self-harm rate for intervention wards was compared to that for control wards (i.e. via relative risk), reductions in rates of self-harm were seen across all seven intervention wards (range: −7.2% to −73.2%).

When data from all wards at Trusts A–D were combined, there was a significant inverse-weighted average relative risk percentage change of −38.9% (95% CI: −60.0%, −6.8%; Figure B1, Appendix B). The control ward that was used for Wards 5 and 6 at Trust C had a low pre-implementation self-harm rate and unusually high variance; therefore, the meta-analysis was repeated with these wards excluded. This resulted in an inverse-weighted average relative risk percentage change of −37.5% (95% CI: −62.4%, 3.9%).

For Trust E, which had no control groups, reductions in self-harm incident rates were seen across all five intervention wards (range: −9.1% to −29.8%).

Falls on older adult mental health wards

Fall data were collected from seven older adult mental health wards across three NHS mental health trusts (Trusts A, C and F). Staff documented a total of 1,039 bedroom falls on these wards during the evaluation periods. Table B3 in Appendix B summarises the findings related to patient falls. Due to low incident rates, data from Wards 22 and 24 at Trust F were combined and analysed as a single ward (reducing the number of wards discussed to six). These wards were considered clinically comparable by the trust, with similarities in patient cohort, care protocols and staffing structures.

Reductions in fall rate were seen from the pre- to the post-implementation on all five intervention wards across Trust A and F (range: −27.5% to −65.4%). On the older adult ward

at Trust C, there was a 6.5% increase in fall rate. When data from all six wards were combined, there was an inverse-weighted average percentage change of −36.6% (95% CI: −52.1%, −16.2; Figure B2, Appendix B).

Assaults and use of restraint in PICUs

Assault data were collected from 10 PICUs across six NHS mental health trusts (Trusts A–F), with staff reporting a total of 2,226 assaults during the evaluation periods. Data on physical restraint were available from four PICUs at three trusts (Trusts B, C, E and F). Rapid tranquillisation events were quantified for five PICUs at four trusts (Trusts A–C and E); however, due to low incident rates, data from Wards 20 and 21 at Trust E were combined and analysed as a single ward (reducing the number of wards discussed to four). Trust E regarded these wards as clinically similar to one another. Across the four trusts with restraint data, a total of 1,108 incidents involving physical restraint and/or rapid tranquillisation were recorded during the pre- and post-implementation periods. A summary of the findings for these outcome measures is provided in Table B4 in Appendix B.

Regarding incidents of assault, seven of the 10 PICUs saw reductions following the monitoring platform's implementation (range: −24.0% to −36.2%), while three wards experienced increases (range: 0.5% to 9.8%). A meta-analysis across all 10 wards showed a significant inverse-weighted average percentage change of −21.1% (95% CI: −31.1, −9.6%; Figure B3, Appendix B). Due to missing patient IDs in half of Trust F's assault data, this analysis was repeated with Wards 26–29 excluded, resulting in an inverse-weighted average percentage change of −13.8% (95% CI: −31.2, 7.9%).

Use of physical restraint decreased across all four analysed wards from the pre- to post-implementation period (range: −20.5% to −29.1%), with a combined inverse-weighted average percentage change of −24.2% (95% CI: −50.2, 15.2; Figure B4, Appendix B). Similarly, all four analysed wards showed reductions in the use of rapid tranquillisation (range: −6.9% to −52.6%), and the meta-analysis revealed an inverse-weighted average percentage change of −33.6% (95% CI: −60.1, 10.3; Figure B5, Appendix B).

Summary of results

Post-implementation reductions in event rates were observed across most intervention wards for the evaluated outcome measures: self-harm, falls, assaults and use of restraint (physical and rapid tranquillisation). A summary of the results is provided below, with meta-analysis findings outlined in Table 2:

Table 2. Summary of meta-analyses results across all outcome measures

Safety event	No. of trusts	No. of intervention wards	Change (%)	95% CIs (%) Lower	Upper
Self-harm[a]	4	7	−38.9	−60.0	−6.8
Falls	3	7[b]	−36.6	−52.1	−16.2
Assaults	6	10	−21.1	−31.1	−9.6
Restraint – physical	3	4	−24.2	−50.2	15.2
Restraint – rapid tranquillisation	4	5[b]	−33.6	−60.1	10.3

Note(s): CI = confidence interval. [a]For self-harm, the meta-analysis included six control wards; therefore, change statistics reported are based on relative risk. [b]Due to low incident rates, data from two wards were combined and these wards were treated as a single ward in the analysis
Source(s): Authors' own work

- *Self-harm incidents:* Across seven acute mental health wards at four NHS trusts, bedroom self-harm rates decreased compared to control groups, with a significant inverse-weighted average relative risk percentage change of −38.9% (95% CI: −60.0%, −6.8%). In a fifth trust, where no control wards were available, reductions in bedroom self-harm were seen across all five analysed wards.
- *Falls:* Reductions in bedroom fall rates were observed on five of six older adult wards across three NHS trusts, resulting in a significant inverse-weighted average percentage change of −36.6% (95% CI: −52.1%, −16.2%).
- *Assaults:* Seven of 10 PICUs at six NHS trusts witnessed reductions in assault incidents, while three wards saw slight increases. The meta-analysis revealed a significant inverse-weighted average percentage change of −21.1% (95% CI: −31.1%, −9.6%).
- *Use of physical restraint and rapid tranquillisation:* Across three NHS trusts, physical restraint decreased on all four analysed PICU wards, with an inverse-weighted average percentage change of −24.2% (95% CI: −50.2%, 15.2%). Similarly, rapid tranquillisation incidents declined across all four PICUs at four NHS trusts, with an inverse-weighted average percentage change of −33.6% (95% CI: −60.1%, 10.3%).

Discussion

This research investigated the impact of implementing a contactless patient monitoring platform on the incidence of safety events across 29 wards at six NHS mental health trusts in England. Key safety concerns were evaluated within three distinct care pathways: self-harm on acute mental health wards, falls on older adult wards, and assaults and restraints (both physical and chemical, i.e. rapid tranquillisation) in PICUs. Results varied by ward, with some experiencing minimal change or increases in incidents, but the majority demonstrated reductions in safety event rates after the monitoring platform was introduced into clinical practice. Moreover, a series of meta-analyses incorporating all feasible data indicated marked reductions across all five outcome measures, ranging from −21.1% to −38.9%.

There are numerous mechanisms through which the monitoring platform may assist staff in preventing safety events on mental health wards, and these can be broadly categorised into direct and indirect types. An exhaustive discussion is beyond the scope of this paper, but examples of direct mechanisms include proactive interventions triggered by the monitoring platform's alerts. For instance, occasions when a patient spends an extended period of time in a high-risk location like the bathroom or doorway (areas where self-harm incidents are more likely to occur), when a frail patient gets out of bed, or when a patient leaves their room and enters a busy communal area where conflict situations could arise (Weltens *et al.*, 2021). Staff may also use activity reports from the monitoring platform to identify patterns of behaviour – such as frequent trips to the bathroom which could indicate risks related to self-harm and falls – to inform care decisions.

Alongside these direct mechanisms, the monitoring platform may contribute to inpatient safety through complex, indirect interactions that influence the actions of both staff and patients. For example, remote night-time observations reduce sleep disturbance (Barrera *et al.*, 2020), which could mitigate safety issues linked to inadequate rest such as suicidal ideation (Gazor *et al.*, 2020), delirium (Farasat *et al.*, 2020), paranoia (Blanchard *et al.*, 2020) and aggressive behaviour (Langsrud *et al.*, 2018). Furthermore, improved risk management facilitated by the monitoring platform can reduce the need for 1:1 observations. For some patients, a reduction in close supervision may foster a greater sense of privacy and autonomy,

strengthen staff–patient relationships, and lead to safer and more therapeutic environments (Health Services Safety Investigations Body, 2024).

The findings presented in this paper carry important implications. The need to enhance safety in mental health hospitals has been recognised for at least a decade. Recent inquiries, including those led by the Department of Health and Social Care (Department of Health and Social Care, 2024a) and the Health Services Safety Investigations Body (Health Services Safety Investigations Body, 2024), have highlighted critical gaps in care and emphasised the urgency of improvements. Although some initiatives have been established, the limited progress suggests that alternative approaches to risk management should be considered. Creating safer inpatient services is a multifaceted challenge that clearly cannot be solved through use of the monitoring platform alone, nor through any other single solution. Even so, our findings indicate an association between use of the tool and improved management of risk across diverse care settings. Wider rollout could therefore support national efforts to enhance safety in mental health hospitals.

While early research suggests that the monitoring platform is well-accepted among the majority of patients (Dewa *et al.*, 2023; Ndebele *et al.*, 2023; Nolan, 2024), concerns have been raised regarding privacy and its perception as a form of restrictive practice (Rethink Mental Illness, 2023). These concerns echo wider debates about technology-mediated healthcare and its ethical implications (e.g. Grosman-Rimon and Wegier, 2024). Scholars have highlighted a range of possible issues, including those relating to data management, consent and how digital tools may affect patient-staff dynamics (Martinez-Martin *et al.*, 2021; Ramvi *et al.*, 2023). The possibility of relational shifts carries particular weight in mental health care, where therapeutic relationships are central to recovery.

Balancing the monitoring platform's safety benefits with careful management of its potential risks is essential. National best practice guidelines exist to support this and to guide the development of standard operating procedures (National Mental Health and Learning Disability Nurse Directors Forum, 2022). NHS England (2025) has also set out principles for the use of digital technologies in mental health inpatient care, and the Care Quality Commission (2025) has issued complementary guidance for providers and inspectors on contactless patient monitoring platforms. Together, these frameworks offer practical direction for implementation, emphasising a human-rights approach and ensuring that the technology supports rather than replaces staff. They also highlight the importance of robust staff training and open communication with patients and carers.

Limitations and directions for future research

As a real-world evaluation, this work offers valuable insight into the impact of the monitoring platform under everyday clinical conditions. However, the approach involves constraints relating to data quality, consistency and analytical control. First, not all wards could be included in the self-harm meta-analysis, and several pragmatic but methodologically imperfect decisions were necessary to maximise data inclusion across the outcomes. These included combining data from similar wards and incorporating incomplete records where appropriate. Second, there was considerable variation in incident rates between trusts, likely reflecting differences in how incidents were classified and reported. Third, in the absence of suitable comparators, control wards were not included in the analyses for falls, assaults or restraints. Collectively, these limitations may introduce bias, reduce comparability across sites and restrict the generalisability of the findings.

It is also important to acknowledge the volatility of healthcare environments. Outcomes may have been influenced by extraneous factors such as changes in patient populations, local policies and resource availability. Notably, data for five of the six evaluations (Trusts B–F) were collected

during periods overlapping with the coronavirus pandemic, and responses to this public health emergency may have affected incident rates. In some cases, event rates – particularly for self-harm – increased from the pre- to post-implementation period. Although these increases were generally smaller on wards using the monitoring platform than on control wards, they reflect the complex safety landscape of inpatient mental health services and the influence of wider contextual factors. Nonetheless, reductions in safety events were observed across most intervention wards, suggesting that the improvements did not occur by chance alone.

This research sheds light on how use of the monitoring platform may influence safety outcomes, but it examined only the most significant safety concern(s) for each care pathway. It did not encompass the full range of safety events or ward types. In addition, the analysis relied entirely on incident data without capturing patient and staff experiences of the technology, which are key to understanding its broader impact and the mechanisms through which it supports safer care.

Future work should explore how patients and staff perceive and engage with the monitoring platform in practice, and how these experiences shape its integration into care and its overall effectiveness. The perspectives of carers should also be considered. Mixed-method studies combining qualitative and quantitative data would help to build an evidence base on the platform's usability, acceptability and sustainability. Longitudinal studies incorporating patient-level data are also needed to examine how the effects of the monitoring platform evolve over time and how they may differ across patient characteristics such as diagnosis, age and gender. Research undertaken in varied healthcare systems and cultural contexts would further test the applicability and external validity of the findings.

Conclusion

This research highlights a promising association between use of a contactless patient monitoring platform and reductions in safety events in inpatient mental health settings. While further studies with stronger methodological controls are needed to validate the findings, this is the first analysis to demonstrate the technology's potential to support safety improvements across multiple sites, service types and outcomes. As with any digital tool introduced into clinical practice, ethical and sensitive implementation, and ongoing thoughtful use, will be essential to realising its full benefits.

Lived experience commentary

The individual who contributed the commentary below also provided input to support the development of the manuscript.

As someone who has spent long periods of time on acute mental health wards and PICUs, I know all too well that these are very challenging environments for patients, in which they often feel unsafe, frightened and vulnerable. Observation of physical health and behaviour is an essential part of care but, especially for those who need frequent observations, such monitoring can be intrusive or disruptive, especially of sleep and privacy.

This paper is a welcome contribution to understanding the part that a contactless monitoring platform could play in improving patient safety on mental health wards, with encouraging data on key safety issues that matter very much to patients and their families as well as potential indirect benefits in terms of sleep, rest, anxiety and other psychological distress.

I am pleased that the authors emphasise the need for such a platform to be used within a very careful ethical framework, attentive to the importance of informed consent and current guidance. It is important that the paper makes clear the important indirect gains to patients when wards are less volatile, more stable environments. And crucially, they make clear that

to bring added value, contactless monitoring must allow for more time, not less, for direct interactions between patients and staff, building the therapeutic relationships that help to make acute wards the healing and caring places that they should always be.

Acknowledgements

The authors would like to thank the participating NHS trusts and the lived experience contributor. The data underlying this research are not publicly available due to their sensitive nature. Access to anonymised data may be possible upon reasonable request, subject to appropriate governance and data sharing agreements.

Notes

[1.] Accurate at the time of writing (October 2025).

[2.] Ndebele *et al.* (2022) report on rapid tranquillisation events relating to assault only, whereas this paper reports on all rapid tranquillisation events.

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Supplementary material

The supplementary material for this article can be found online.

Corresponding author

Maria Kekic can be contacted at: maria.kekic@liohealth.com