# Quantitative impact of the Oxehealth system

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NHS
Tees, Esk and Wear Valleys
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oxehealth

# Executive summary

Tees, Esk & Wear Valleys Trust partnered with Oxehealth to improve safety, quality and efficiency of care provided across inpatient wards.

The aim of this evaluation is to assess the impact of Oxevision in the following 3 'active' wards using quantitative data:

| Cedar | Elm | Rowan Lea |
|---|---|---|
| **Mixed PICU** | **Female Acute** | **Mixed Older Adult** |

An observational "before and after" cohort study was completed for Rowan Lea and Elm, and an observational "before and after" study was completed for Cedar to assess Oxevision's impact on:

- Self-harm and assault incidents in Cedar & Elm
- Falls and assaults in Rowan Lea
- Enhanced observation hours in Cedar & Elm[1]
- Bank & Agency spend related to 1 to 1 observations across all three wards

As part of the analysis, confounder interviews were conducted to understand factors other than Oxevision that may have influenced the results. Any identified confounders that may have influenced the results have been highlighted in slides.

[1]31% entries of enhanced observation hours in Rowan Lea's raw data had no end date and therefore it was not possible to analyse impact on enhanced observations for that ward.

# Executive summary

## Patient safety

- **Falls** on Rowan Lea had a **relative reduction of 16%** in bedrooms when compared to the control ward.
- **Assaults** on Rowan Lea had a **relative reduction of 25%-40%** when compared to the control ward.
- **Self-harm** on Elm had a **relative reduction of 7%** in bedrooms when compared to the control ward.
    - **Harmful[1] self-harm** in the bedroom had a **relative reduction of 85%** when compared to the control ward.
    - Ligatures also had a relative decrease when compared to the control ward.
- **Assaults** on Elm **decreased 19% in absolute terms on the ward but had a relative increase** when compared to its control ward.
- **Self-harm on Cedar reduced by 25% in absolute terms** in bedrooms.
- **Assaults on Cedar increased by 17% and 10% in absolute terms** in bedrooms and across the ward, respectively.

## Value for money – FOR DISCUSSION

- This project did not expect to reduce enhanced (1 to 1 or higher) observation hours as per the agreed SOPs and protocols on the ward.
- Data was received for enhanced observation hours (translated into spend) and for bank/agency spend.
- It is unlikely that this data can be used to assess value for money due to several reasons:
    - Data for Rowan Lea was unusable as a result of poor data quality[2]
    - Cedar's patient demographic became significantly more skewed to female patients post go-live, which is likely to have increased enhanced observations due to a higher risk of incidents
    - The approach to inputting request reasons in bank and agency spend changed during the COVID-19 pandemic; the data shows a significant reduction in spend for enhanced observations but may be the result of a shift in “request reason” to COVID-19

1.Harmful incidents are incidents classified as moderate degree of harm or higher. A moderate degree of harm incident is an incident that resulted in significant but not permanent harm, e.g. a fracture.
2. 31% entries of enhanced observation hours in Rowan Lea's raw data had no end date and therefore an analysis was not conducted due to data limitations.

# Key findings – Impact on patient safety

## Rowan Lea
**Older Adult**

**16%** ↓
Relative change in **bedroom falls**

**25-40%** ↓
Relative change in **assaults**

## Elm
**Female acute**

**7%** ↓
Relative change in **bedroom self-harms**

**85%** ↓
Relative change in **harmful[1] bedroom self-harms**

**73-143%** ↑
Relative change in **assaults**

19% ↓ vs. baseline

## Cedar
**Mixed PICU**

**25%** ↓
change vs. baseline in **bedroom self-harms**

**37%** ↓
change vs. baseline in **harmful[1] bedroom self-harms**

**10-17%** ↑
change vs. baseline in **assaults**

1. Harmful incidents are incidents classified as moderate degree of harm or higher. A moderate degree of harm incident is an incident that resulted in significant but not permanent harm, e.g. a fracture.

# Methodology

**Methods**: A "before and after" cohort study for Rowan Lea and Elm, and a "before and after" study for Cedar.

Cedar was found to have a higher proportion of female patients compared to its potential control ward, Bedale. Due to the difference in patient demographics, Bedale was not a suitable control ward for Cedar.

**Time period**: Data was collected from March 2020 to September 2021.

**Data analysed**: Self-harm, assault, and fall incident data, enhanced observation hours, and bank and agency spend related to increased observations.

**Confounders**: Evaluated via interviews with Ward Managers and Matrons across active and control wards.

**Limitations**: Results should be considered under the limitations of confounders effects that were investigated in the study. This is primarily the nature of the pandemic and its potential impact on these data.

| Active ward | Pathway | Baseline period | Post go-live period | Evaluation period | Control wards |
|---|---|---|---|---|---|
| Elm | Female acute | 20 Mar 20 to 17 Nov 20 | 17 Nov 20 to 30 Sep 21 | 8-month baseline<br>11-month post go-live | Tunstall |
| Cedar | Mixed PICU | 20 Mar 20 to 16 Nov 20 | 16 Nov 20 to 30 Sep 21 | 8-month baseline<br>11-month post go-live | No control |
| Rowan Lea | Mixed older adult | 20 Mar 20 to 06 Jan 21 | 06 Jan 21 to 30 Sep 21 | 10-month baseline<br>9-month post go-live | Westerdale South[1]<br>Westerdale North[1] |

1. A control ward average was used to evaluate Rowan Lea. This was worked out by taking the mean average of two control wards (Westerdale North and Westerdale South). Results were annualised to determine the impact per year and normalised to account for different ward sizes.

# Limitations

**COVID-19 pandemic:** The COVID-19 pandemic is highly likely to have impacted wards in different ways, for example, staffing. The impact of COVID-19 cannot be adjusted for in the analysis, but efforts have been made to try to minimise its effect by defining the evaluation periods and using control wards.

**Low sample sizes:** The low number of assaults in Tunstall may have limited the analysis for comparison with Elm. In addition, the low number of moderate or higher self-harms, assaults, and falls may have limited the severity analysis across the evaluation.

**Suitability of control wards:** The control wards used were not exactly the same as the active wards but were sufficiently similar to be compared. The control wards had the same pathways, similar ward designs and patient demographics.

However, confounder interviews with Ward Managers showed differences between the wards that may have influenced the results of the analysis. Details of these influencing factors are shared alongside the analysis.

Cedar was found to have a higher proportion of female patients compared to its potential control ward, Bedale. This was a result of aiming to improve sexual safety on the wards and made self-harm risk higher on Cedar than on Bedale. This difference between the wards meant that **Bedale was not a suitable control ward for Cedar.**

**Bank and agency spend related to increased observations:** Request reasons for bank and agency staff have been significantly skewed towards COVID-19 during the pandemic. Conclusions from these results may have been impacted by this change.

**Enhanced observations data:** Rowan Lea enhanced observation data was incomplete and therefore was not analysed. Rowan Lea's bank and agency spend related to increased observations was still analysed.

**Potential unknown confounders:** Analysis conducted on data from real world environments may be influenced by changes and initiatives ongoing to varying extents on the wards and may affect these results.

## Clinical impact:

Impact on incidents and severity of harm related to self-harm and assaults

# Key findings – Impact on patient safety

## Rowan Lea
**Older Adult**

**16%** ↓
Relative change in **bedroom falls**

**25-40%** ↓
Relative change in **assaults**

## Elm
**Female acute**

**7%** ↓
Relative change in **bedroom self-harms**

**85%** ↓
Relative change in **harmful[1] bedroom self-harms**

**73-143%** ↑
Relative change in **assaults**

19% ↓ vs. baseline

## Cedar
**Mixed PICU**

**25%** ↓
change vs. baseline in **bedroom self-harms**

**37%** ↓
change vs. baseline in **harmful[1] bedroom self-harms**

**10-17%** ↑
change vs. baseline in **assaults**

1. Harmful incidents are incidents classified as moderate degree of harm or higher. A moderate degree of harm incident is an incident that resulted in significant but not permanent harm, e.g. a fracture.

# Rowan Lea reduced bedroom falls by 16% relative to the control

Rowan Lea, mixed older adults

Falls

- **Falls** on Rowan Lea had a relative **reduction of 16%** in the bedrooms when compared to the control ward.
- **Harmful falls**[1] in the **bedroom increased by 31% (2 to 7)** but **reduced by 32% on the ward** relative to the control ward. It is important to note that the **small sample size** collected could potentially influence the "harmful falls" results.
- As a COVID-19 admission ward, patients in Rowan lea were required to isolate in bedrooms upon entry. This is likely to have impacted the bedroom fall results in Rowan Lea, especially as patients tend to fall more in the first 24-72 hours of admission. These results are likely underestimates.

**Bedroom falls, annualised**

| | Ward | Baseline | Post go-live | Change (%) | Relative change (%) |
|---|---|---|---|---|---|
| **Bedroom falls** | **Rowan Lea** | **61** | **65** | **7%** | **-16%** |
| | Westerdale (Avg) | 115 | 147 | 28% | |
| **Harmful falls** | **Rowan Lea** | **2** | **7** | **339%** | **31%** |
| | Westerdale(Avg) | 1 | 5 | 235% | |

**Ward falls, annualised**

| | Ward | Baseline | Post go-live | Change (%) | Relative change (%) |
|---|---|---|---|---|---|
| **Ward falls** | **Rowan Lea** | **110** | **116** | **5%** | **-27%** |
| | Westerdale (Avg) | 182 | 262 | 44% | |
| **Harmful falls** | **Rowan Lea** | **5** | **7** | **46%** | **-32%** |
| | Westerdale (Avg) | 4 | 8 | 115% | |

1.Harmful incidents are incidents classified as moderate degree of harm or higher. A moderate degree of harm incident is an incident that resulted in significant but not permanent harm, a e.g. a fracture.

# Rowan Lea reduced assaults by 25-40% relative to the control

Rowan Lea, mixed older adults

Assaults

- **Assaults** on Rowan Lea had a relative **reduction of 25% and 40%** in the bedrooms and on the ward respectively, when compared to the control ward.
- Throughout the evaluation time period Rowan Lea reported no harmful assaults.

**Bedroom assaults, annualised**

| | Ward | Baseline | Post go-live | Change (%) | Relative change (%) |
|---|---|---|---|---|---|
| **Bedroom assaults** | **Rowan Lea** | **39** | **25** | **-34%** | **-25%** |
| | Westerdale (Avg) | 52 | 46 | -12% | |
| **Harmful assaults** | **Rowan Lea** | **0** | **0** | **0%** | **N/A** |
| | Westerdale(Avg) | 1 | 0 | -100% | |

**Ward assaults, annualised**

| | Ward | Baseline | Post go-live | Change (%) | Relative change (%) |
|---|---|---|---|---|---|
| **Ward assaults** | **Rowan Lea** | **173** | **116** | **-33%** | **-40%** |
| | Westerdale (Avg) | 207 | 233 | 12% | |
| **Harmful assaults** | **Rowan Lea** | **0** | **0** | **0%** | **N/A** |
| | Westerdale(Avg) | 1 | 0 | -100% | |

# Key findings – Impact on patient safety

## Rowan Lea
**Older Adult**

**16%** ↓
Relative change in **bedroom falls**

**25-40%** ↓
Relative change in **assaults**

## Elm
**Female acute**

**7%** ↓
Relative change in **bedroom self-harms**

**85%** ↓
Relative change in **harmful[1] bedroom self-harms**

**73-143%** ↑
Relative change in **assaults**

19% ↓ vs. baseline

## Cedar
**Mixed PICU**

**25%** ↓
change vs. baseline in **bedroom self-harms**

**37%** ↓
change vs. baseline in **harmful[1] bedroom self-harms**

**10-17%** ↑
change vs. baseline in **assaults**

1. Harmful incidents are incidents classified as moderate degree of harm or higher. A moderate degree of harm incident is an incident that resulted in significant but not permanent harm, e.g. a fracture.

# Elm reduced bedroom self-harms by 7% and harmful self-harms by 85% relative to the control

Elm, female acute

Self-harm

- **Self-harm** in bedrooms on Elm had a **relative reduction of 7%** when compared to the control ward.
- **Ligatures** in bedrooms had a **relative reduction of 7%** when compared to the control ward.
- **Harmful self-harms** in bedrooms had a **relative reduction of 85% (7 to 4)** when compared the control ward (2 to 6).
- Tunstall has a newer anti-ligature environment (compared to Elm) and different approaches to patient risk management for self-harm. For example, Tunstall has a higher proportion of patients on 1 to 1 observations to manage self-harm. Both these factors are highly likely to have impacted the results below. These results are likely underestimates.

**Bedroom self-harms, annualised**

-7% ligatures relative to control

| | Ward | Baseline | Post go-live | Change (%) | Relative change (%) |
|---|---|---|---|---|---|
| **Bedroom self-harms** | **Elm** | **223** | **353** | **58%** | **-7%** |
| | Tunstall | 65 | 111 | 70% | |
| **Harmful self-harms** | **Elm** | **7** | **4** | **-44%** | **-85%** |
| | Tunstall | 2 | 6 | 274% | |

**Ward self-harms, annualised**

| | Ward | Baseline | Post go-live | Change (%) | Relative change (%) |
|---|---|---|---|---|---|
| **Ward self-harms** | **Elm** | **286** | **401** | **40%** | **-4%** |
| | Tunstall | 86 | 127 | 47% | |
| **Harmful self-harms** | **Elm** | **7** | **5** | **-25%** | **-80%** |
| | Tunstall | 2 | 6 | 274% | |

[1]Confounder interviews highlighted differences in building infrastructure between Elm and Tunstall, with Tunstall having a more "ligature-safe" hospital building this could be a potential factor that contributed to the higher number of ligature incidents on Elm than Tunstall in the baseline and post-go live periods.

# Elm increased assaults relative to the control but decreased assaults when compared to its baseline

Elm, female acute

Assaults

- **Assaults** on Elm **had a relative increase of 143% when compared to the control ward but decreased by 19% vs. the baseline on the ward.**
- There were **no harmful assaults** during the evaluation period.
- Elm and Tunstall have differences in their approach to patient risk management, for example Tunstall has a higher proportion of patients on 1 to 1 observations, which could impact the number of assaults between wards.

**Bedroom assault incidents, annualised**

| | Ward | Baseline | Post go-live | Change (%) | Relative change (%) |
|---|---|---|---|---|---|
| **Bedroom assaults** | **Elm** | **22** | **23** | **3%** | **73%** |
| | Tunstall | 8 | 5 | -40% | |
| **Harmful assaults** | **Elm** | **0** | **0** | **N/A** | **N/A** |
| | Tunstall | 0 | 0 | N/A | |

**Ward assault incidents, annualised**

| | Ward | Baseline | Post go-live | Change (%) | Relative change (%) |
|---|---|---|---|---|---|
| **Ward assaults** | **Elm** | **143** | **115** | **-19%** | **143%** |
| | Tunstall | 41 | 14 | -67% | |
| **Harmful assaults** | **Elm** | **0** | **0** | **N/A** | **N/A** |
| | Tunstall | 0 | 0 | N/A | |

# Key findings – Impact on patient safety

Rowan Lea
**Older Adult**

**16%** ↓
Relative change in **bedroom falls**

**25-40%** ↓
Relative change in **assaults**

Elm
**Female acute**

**7%** ↓
Relative change in **bedroom self-harms**

**85%** ↓
Relative change in **harmful[1] bedroom self-harms**

**143-73%** ↑
Relative change in **assaults**

19% ↓ vs. baseline

Cedar
**Mixed PICU**

**25%** ↓
change vs. baseline in **bedroom self-harms**

**37%** ↓
change vs. baseline in **harmful[1] bedroom self-harms**

**10-17%** ↑
change vs. baseline in **assaults**

1. Harmful incidents are incidents classified as moderate degree of harm or higher. A moderate degree of harm incident is an incident that resulted in significant but not permanent harm, e.g. a fracture.

# Cedar reduced self-harms and harmful self-harm, but assaults slightly increased

Cedar, mixed PICU

Self-harm & Assaults

- Self-harm incidents on Cedar **decreased vs. the baseline by 25%** in the bedrooms.
- **Harmful** self-harms in bedrooms **decreased by 37% (2 to 1).**
- **Assaults increased 17% and 10%** vs. the baseline in the bedroom and on the ward, respectively. There were no assaults of moderate, severe, or major severity.
- There was an **increasing proportion of female patients** on Cedar **making self-harm and assault risks higher** post go-live. This is highly likely to have **underestimated the results** laid out below. On Cedar, the proportion of female patients increased (from 4:6 to 1:9 male to female ratio).

**Bedroom and ward self-harms, annualised**

| | Baseline | Post go-live | Change (%) |
|---|---|---|---|
| **In the bedroom** | | | |
| **Bedroom self-harms** | 264 | 198 | **-25%** |
| **Harmful self-harms** | 2 | 1 | **-37%** |
| **On the ward** | | | |
| Ward self-harms | 298 | 236 | -21% |
| Harmful self-harms | 2 | 4 | 89% |

9% increase in ligatures

**Bedroom and ward assaults, annualised**

| | Baseline | Post go-live | Change (%) |
|---|---|---|---|
| **In the bedroom** | | | |
| **Bedroom assaults** | 73 | 85 | **17%** |
| **Harmful assaults** | 0 | 0 | 0% |
| **On the ward** | | | |
| **Ward assaults** | 270 | 297 | 10% |
| **Harmful assaults** | 0 | 0 | 0% |

# Value for money:

Impact on observation hours and Bank & Agency spend

# This project was not expected to deliver a reduction in enhanced observations and the data quality is poor

- The system can help staff to better manage patient risk while enabling less restrictive practices, which can lead to stepping down 1 to 1 observations earlier or completely.

- However, Standard Operating Procedures (SOPs) related to enhanced observations were **explicitly not modified** and staff were **trained to not consider the system as a tool in relation to support stepping down** 1 to 1 observations.

- Data was received for enhanced observation hours (translated into spend) and for bank/agency spend.

- It is unlikely that this data can be used to assess value for money due to several reasons:
  - Data for Rowan Lea was unusable as a result of poor data quality
  - Cedar's patient demographic became significantly more skewed to female patients (from 4:6 to 1:9 male to female ratio) from January 2021 (post go-live), which is likely to have increased enhanced observations due to a higher risk of incidents
  - The approach to inputting request reasons in bank and agency spend changed during the COVID-19 pandemic; the data shows a significant reduction in spend for enhanced observations but may be the result of a shift in "request reason" to COVID-19

- The results show that enhanced observations have **reduced for Elm**, **increased for Cedar**, and **could not be analysed for Rowan Lea**[1], while bank and agency spend related to enhanced observation has **significantly reduced in all wards**.

1. 31% entries of enhanced observation hours in Rowan Lea's raw data had no end date.

# For Discussion: observational hours vs. B&A spend

**Enhanced observation hours, annualised**

| Ward | Baseline | Post go-live | Change (%) | Change (£) | Relative change (%) | Relative change (£) |
|---|---|---|---|---|---|---|
| **Elm** | [I/S] | | | | | |
| Tunstall | | | | | | |
| **Rowan Lea** | | | | | | |
| **Cedar** | | | | | | |

**Bank and agency spend related to increased observations, annualised**

| Ward | Baseline (£) | Post go-live(£) | Change(£) | Change (%) | Relative change (£) | Relative change (%) |
|---|---|---|---|---|---|---|
| **Elm** | [I/S] | | | | | |
| Tunstall | | | | | | |
| **Rowan Lea** | | | | | | |
| Westerdale Avg | | | | | | |
| **Cedar** | | | | | | |

# Appendix

# Older adult confounders



**Rowan Lea**

- Staffing challenges due to COVID-19: Use of temporary staff increased to support COVID-19 isolations requirements on the ward.
- Patient isolation requirements due to COVID-19 and impact on bedroom falls: Became a COVID-19 admissions ward during pandemic where patients had to isolate for 24hr on entry. This is highly likely to impact the bedroom fall results in Rowan Lea, especially as patients tend to fall more in the first 24-72 hours of admission.

**Westerdale**

- Staffing challenges due to COVID-19: Use of temporary staff increased to cover staffing shortfalls caused by the pandemic.
- Increased staffing establishment: Staffing establishment review on Westerdale North completed in October 21 increased number of staff on each shift by 1. This was implemented after the evaluation period and therefore will not affect the results.
- Patient demographics: Patient with Parkinson's diagnosis was considered to be a frequent faller. This patient was considered not to be outlier and the analysis showed that the person fell 9 times which did not skew results.

# Female acute confounders



**Elm**

- Staffing challenges due to COVID-19: Use of temporary staff increased to cover staffing shortfalls caused by the pandemic.
- Enhanced observations: Patients on this ward therapeutically benefit from positive-risk taking which has led staff to care for patients in the least restrictive way possible, using observations only when necessary and instead opting for engagement levels.

**Tunstall**

- Staffing impact due to COVID-19: Throughout the pandemic, Tunstall supported two COVID admission wards where they would move patients to if they needed isolation. Tunstall supported these wards by providing staff from their staffing establishment and therefore increased staffing requests.
- Enhanced observations: Higher proportion of patients on 1 to 1 observations (3 patients on 1 to 1 for the last 12 months) compared to Elm which may have impacted incident levels.
- Environmental differences: There were differences in building infrastructure (e.g. shower curtains, plants, shower vents, windows) between Elm and Tunstall, with Tunstall having a more “ligature-safe” hospital building. This could potentially contribute to the difference in number of self-harms, particularly ligatures, between wards.

# PICU confounders



**Cedar**

- Staffing challenges due to COVID-19: Use of temporary staff increased to cover staffing shortfalls caused by the pandemic.
- Increased self-harm risk: Higher proportion of young female patients (from 4:6 to 1:9 male to female ratio) from January 2021. This increased the self-harm risk, and therefore the use of enhanced observations to better manage risk. This **potentially impacted the number of 1 to 1 observation hours and the number of incidents** in Cedar across the evaluation period.

# Cedar and Bedale self-harm incidents

| | Ward | Baseline | Post go-live | Change (%) | Relative change (%) |
|---|---|---|---|---|---|
| **Bedroom self-harms** | **Cedar** | **264** | **198** | **-25%** | 191% |
| | Bedale | 152 | 39 | -74% | |
| **Harmful self-harms** | **Cedar** | **2** | **1** | **-37%** | N/A |
| | Bedale | 14 | 0 | -100% | |

| | Ward | Baseline | Post go-live | Change (%) | Relative change (%) |
|---|---|---|---|---|---|
| **Ward self-harms** | **Cedar** | **298** | **236** | **-21%** | 138% |
| | Bedale | 248 | 82 | -67% | |
| **Harmful self-harms** | **Cedar** | **2** | **4** | **89%** | N/A |
| | Bedale | 24 | 0 | -100% | |

# Cedar and Bedale assault incidents

| | Ward | Baseline | Post go-live | Change (%) | Relative change (%) |
|---|---|---|---|---|---|
| **Bedroom assaults** | **Cedar** | **73** | **85** | **17%** | 187% |
| | Bedale | 83 | 34 | -59% | |
| **Harmful assaults** | **Cedar** | 0 | 0 | 0% | N/A |
| | Bedale | 2 | 0 | -100% | |

| | Ward | Baseline | Post go-live | Change (%) | Relative change (%) |
|---|---|---|---|---|---|
| **Ward assaults** | **Cedar** | **270** | **297** | **10%** | 35% |
| | Bedale | 277 | 226 | -18% | |
| **Harmful assaults** | **Cedar** | 0 | 0 | 0% | N/A |
| | Bedale | 4 | 1 | -63% | |

# Bank and agency spend related to 1 to 1 observations

| Bank & Agency 1 to 1 spend (Annualised) | | | | | | |
|---|---|---|---|---|---|---|
| **Ward** | **Baseline (£)** | **Post go-live(£)** | **Change(£)** | **Change (%)** | **Relative change (£)** | **Relative change (%)** |
| **Elm** | [I/S] | | | | | |
| Tunstall | | | | | | |
| **Cedar** | | | | | | |
| Bedale | | | | | | |
| **Rowan Lea** | | | | | | |
| Westerdale Avg | | | | | | |

# Bank and agency total spend

| Bank & Agency total spend (Annualised) | | | | | | |
|---|---|---|---|---|---|---|
| **Ward** | **Baseline (£)** | **Post go-live (£)** | **Change (£)** | **Change (%)** | **Relative change (£)** | **Relative change (%)** |
| **Elm** | [I/S] | | | | | |
| Tunstall | | | | | | |
| **Cedar** | | | | | | |
| Bedale | | | | | | |
| **Rowan Lea** | | | | | | |
| Westerdale Avg | | | | | | |

# Early signs the system is delivering operational value

Early insights report

- **76%** staff reported that **observation levels for some patients can be lowered** because patient risk can be better managed[1].
- **63%** staff reported that their **observation rounds are faster** when they use the system to confirm patient safety at night[2].

*"At times, the Oxehealth system **stops us from increasing observation levels.***

*For example, there was a lady who had a lot of **aggression** and instead of going into her room and **agitating her** we opted for **stepping down her observation levels** and checked on her with Oxehealth until she would calm down."*

[I/S] Staff Nurse

*"The Oxehealth system has helped **save time in the sense that it is easier to check patients that need that a bit more attention** in between checks. We are able to focus on the room and see what they are doing and to **make sure that they are safe.** We are still taking observations from the care round every hour but I can use Oxehealth in between checks to know that the patients are safe."*

[I/S] Healthcare Assistant

[1]N=29, [2]N=24

# Methodology details

**Completed analysis:** A before and after study was completed for Elm, Cedar, and Rowan Lea. Tunstall and Bedale were used as control wards for Elm and Cedar, respectively. A mean average of data from Westerdale South and Westerdale North was used as a control ward, Westerdale (Avg.) for Rowan Lea.

The number and severity of self-harm, assaults and falls, bank and agency spend related to 1:1 observations data, and enhanced observation hours was compared before (baseline period) and after go-live (post go-live period) to calculate the impact of the Oxehealth system and compared to a control ward.

- **Incidents:** Records of incidents were collected from the Trust's Datix system for analysis. Many different fields and factors were used to analyse all the incident category types, specifically focusing around assaults, self harms, and falls.
- **Bank and agency:** Spend on bank and agency staff was collected by requesting hours and cost for each instance of bank and agency use. Request reason for additional staff was analysed with 1:1 observation spend being used to measure the impact of the system.
- **Enhanced observation hours:** Records of patient observation levels were analysed to total the amount of staffing hours used to monitor patients in a 1 to 1, or more than 1 to 1, setting.

**Data normalisation and extrapolation:** A weighting is applied to normalize the data using Occupied Bed Days (OBDs) to account for variation in occupancy and ward size (i.e. number of bedrooms), and then annualized to determine the impact per year.

**Outliers treatment:** Outliers are data points that differ significantly from other data points and unexpected (i.e. it would not be expected to occur). Therefore, outliers can skew the results of an analysis and make the results less representative of the realistic impact of the system.

Outliers were considered for self-harm, assault, and fall incidents separately. Patients were considered as outliers if they had:

- More than 30 self-harms and an incident rate of 0.5 per day or higher
- More than 20 assaults and an incident rate of 0.5 per day or higher
- More than 15 falls and an incident rate of 0.25 per day or higher

9 outliers were identified in total and removed from the analysis. This was 0.82% of total patients throughout the evaluation time period. The breakdown of outliers was:

- 6 outliers for the analysis of self-harms.
- 3 assaults for the analysis of assault incidents.
- 0 falls for the analysis of assault incidents.

# Control ward suitability

Control wards were assessed on their suitability to evaluate active wards on the following criteria:

- Ward pathway
- Ward size
- Patient gender
- Ward and room design
- Patient length of stay
- The number of baseline incidents
- The baseline Bank and agency spend related to 1 to 1 observations
- Confounders

Tunstall was used as a control ward for Elm.

Cedar did not have a suitable control ward to compare results against due to differences in patient demographics between Cedar and its proposed control ward, Bedale.

Rowan Lea did not have a single suitable control ward to compare results against due to the ward receiving a mix of patients with functional or organic mental health conditions. A mean average of Westerdale North, a functional unit, and Westerdale South, an organic unit, was taken instead and merged into a single ward, Westerdale (Avg).

# Control ward suitability

| Ward factors | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ward** | Cedar | Bedale | Elm | Tunstall | Rowan Lea | Westerdale Avg. | Westerdale North | Westerdale South | Bransdale | Moor Croft | Overdale | Wold View |
| **Pathway** | PICU | PICU | Acute | Acute | Older Adult | | Older Adult | Older Adult | Acute | Older Adult | Acute | Older Adult |
| **Gender** | Mixed | Mixed | Female | Female | Mixed | Mixed | Mixed | Mixed | | | | |
| **Ward Size** | 10 | 10 | 18 | 20 | 20 | 17 | 20 | 14 | 16 | 18 | 14 | 18 |
| **Ensuite** | True | True | True | True | True | True | True | True | True | True | True | True |
| **Baseline figures** | | | | | | | | | | | | |
| **Ward self-harms** | 298.2 | 247.9 | 285.6 | 86.3 | 9.3 | 10 | 16.8 | 2.8 | 80 | 3.3 | 73.5 | 13 |
| **Ward assaults** | 270.3 | 276.8 | 142.8 | 40.9 | 172.5 | 207 | 32.2 | 382.6 | 24.2 | 34.1 | 43.1 | 599.1 |
| **Ward falls** | N/A | | | | 110.3 | 182 | 136.3 | 227.9 | 6 | 35.2 | 9.3 | 199.2 |
| **Bedroom falls** | | | | | 60.6 | 115 | 101.1 | 129.4 | 1.5 | 26.4 | 3.4 | 113.3 |
| **Baseline bank & agency spend for increased obs** | [I/S] | | | | | | | | | | | |
| **Confounders impact** | Significant differences in patient cohort and therefore risks on the ward | | None | | None | | | | Did not evaluate | | | |
| **Overall control ward suitability** | | | | | | | | | | | | |