



**Assessment of error rate and impact of a Digital National Early Warning Score system versus paper system.**

Report on Vital Signs National Early Warning Score Integration Pilot  
Conducted in  
Cavan General Hospital

Report Prepared by

Dr Tanya Mulcahy  
National Manager, Health Innovation Hub Ireland  
Data collected and reviewed by  
Ms Noreen Lynch, CNM2 Bantry General Hospital and HIHI  
Ms Niamh Allen, CNM2 South Infirmary Victoria Hospital and HIHI  
For  
Ronnie McDermott and Gerard Duignan

## **Introduction**

Extended life expectancy, an increasing older population and spiralling healthcare costs have triggered analysis on potential areas for efficiency while delivering better patient outcomes. There is significant evidence to support the clinical impact of early detection of patient deterioration and timely intervention<sup>1,2</sup>. Rapid intervention at an early stage of health deterioration enables treatment at the earliest and least complex stage and has been shown to positively impact patient outcomes, for example in the case of early initiation of the Sepsis Six bundle<sup>3</sup>. In response to this, systems have been developed to monitor and detect patient deterioration - namely Early Warning Score Systems (also known as Track and Trigger systems). Early warning score systems have been in use in the UK, Australia and many European countries for the last ten or more years to positive effect<sup>4</sup>. In February 2013, the Minister for Health Dr James Reilly issued Ireland's First National Clinical Guideline- the National Early Warning Score for Ireland (NEWS)<sup>5</sup>. Early Warning Scores facilitate the early detection of a patient's deterioration by classifying a patient's severity of illness – through the presentation of a 'score' which is calculated based on a number of clinical observations/measurements. For deteriorating patients, the NEWS 'score' triggers a specific care pathway and prompts nursing staff to request a medical review at specific time points<sup>6</sup>. The current NEWS protocol operational in the Irish public health system relies on

the recording of a number of patient measurements (see Appendix 1) by nurses or other healthcare staff; these are recorded on a standard NEWS chart (paper based) and a calculation of score is completed manually by the nurses by applying weighted scores to each individual vital-sign parameter (see Appendix 1 for paper NEWS chart).

There have been a number of published studies and audits on the NEWS in Ireland including a Health Information Quality Authority (Health Technology Assessment Report<sup>7</sup>) review of health economics<sup>8</sup> and the HSE Healthcare Audit End of Year Report 2017<sup>9</sup> lists QAV005/2017- *An audit on the implementation of selected guidelines on the National Early Warning Score 2014* as a report in progress as of December 2017, with the report due April 2018 (unpublished as of January 1, 2019). In 2018, Health Innovation Hub Ireland conducted a pilot study of the Syncrophi KEWS 300 system in St Luke's Hospital Kilkenny and identified a reduction in overall error rate from 49% to 0% (time delays were not included in this analysis). Report available on request from [t.mulcahy@ucc.ie](mailto:t.mulcahy@ucc.ie)

The aim of *this* study was to compare error rates between NEWS recordings made using the paper version versus a digital capture version of NEWS using the Syncrophi KEWS 300 system in a pilot study in Cavan General Hospital. This study is being sponsored by the National Medical Device Office and led by Mr Ronnie McDermott together with Mr Gerard Duignan of the HSE.

Syncrophi is an Irish company who has developed a digital system to capture NEWS observations and present them in a manner that allows easy tracking, auditing and monitoring of NEWS scores and subsequent escalation processes for all patients. The information for all patients is presented on a tablet and can be viewed/managed at the bedside and also at the nurses' station to ensure overview of all patients. With the Syncrophi system (KEWS 300), the NEWS observations are recorded automatically on a digital chart (presented at patient bedside on a tablet). Where observations cannot be recorded using a linked vital-sign monitor (for example 'patient alertness' which is a visual assessment), the nurses input the value directly to the digital chart, the NEWS score is calculated automatically and the appropriate escalation/response is displayed.

The platform allows the clinical staff at the nurses station to have sight of all patient NEWS scores and vital-signs on a single screen (currently these are only available by manually checking the patient charts). The status of each patient (based on score) is presented in an easy to assess, colour coded format with time remaining until next NEWS recording clearly visible on screen.

Implementation and roll out of the KEWS system was conducted by the team at Cavan General Hospital. The role of HIHI was to conduct an independent review of error rates.

**HIHI and HSE Staff assigned to HIHI:**

Dr Tanya Mulcahy- Project Lead- HIHI

Project oversight, data review and final report.

Ms Niamh Allen, CNM2, HSE: Data Analysis and review of final report

Ms Noreen Lynch, CNM2, HSE: Data Analysis and review of final report.

## Results

### Data Analysis:

Error analysis was performed by Ms Niamh Allen CNM 2 and Ms Noreen Lynch, CNM 2, both nurses have been assigned by the HSE to work part-time with HIHI.

20 paper patient charts were selected at random. Patient names and personal information were removed from view. 496 NEWS observations from the 15 charts were reviewed for errors and recorded in an error analysis template/audit tool as described above in Data Analysis. Charts were returned to the patient records.

13 digital patient records were selected at random from the HSE server (covering the period of the digital pilot on the Syncrophi system). Patient names and personal information were removed. 496 NEWS observations were reviewed for errors and recorded in an error analysis template/audit tool.

### Definitions:

**Type 1 error:** this error type did not have an impact on the clinical intervention or score. These errors are listed in the Appendix 6. They do impact record management (missing information), and can add time to a process where patient information, ward numbers, dates etc. are incomplete or missing.

**Type 2 errors** are those that relate to a patient's clinical outcome and may impact intervention, such as an incorrect value being recorded, observations omitted, illegible entries or incorrect calculation of the NEWS score. A full list of error types is provided in the Appendix 6.

### Incomplete/Partial Observations:

An incomplete observation is where there appears to be some recordings missing so that the set of observations is incomplete. This could have been an error in completing the NEWS process or could have been a nurse wanting to conduct an interim check on a single vital-sign parameter e.g. Blood Pressure. While we found many partial observations, that would be considered an error by most clinical staff, in order to ensure only true errors were assessed, any incomplete observations that did not have a score were removed from the analysis. [Note: this is a conservative interpretation and likely understates the true error-rate in paper charts].

## Results:

### Paper NEWS Charts:

#### Cavan Study

496 observations were reviewed for accuracy from a selection of 15 paper NEWS charts. 29 partial observations were noted and removed from the analysis, leaving a total of 467 observations. Errors were classified as **Type 1** or **Type 2** errors.

**322 of the paper chart observations had errors. This represents an error rate of 69% overall (322/467).**

Most observation sets had more than one error. 151 of the observation sets had one or more Type 1 errors and 227 of the observation sets had one or more Type 2 errors.

This finding is critical: that **59% of observation sets had Type 2 errors** – each of which could have an impact on clinical intervention and patient outcome. 23% of these type 2 errors relate to time delays- which is controlled by staff. The remaining 36% of errors were errors in recording information (transcription), incorrect information or incorrectly calculated NEWS scores- errors that could impact on patient outcomes.

**Digital NEWS Charts:**

A total of 583 observations were reviewed from a selection of digital NEWS charts. 21 partial observations were noted and removed from the analysis, leaving 562 observations. With regard to the accuracy of vital-sign charting and NEWS score calculation there were **0% Type I errors found and an error rate of 13.5% Type 2 errors was found.** Further analysis of the type 2 errors showed that all 13.5% of errors related to time delays of initiation of NEWS assessment which is controlled by staff.

Paper overall error rate	Digital overall error rate	Paper type 1 errors	Digital type 1 errors	Paper type 2 errors	Digital type 2 errors	Paper time delay errors	Digital time delay errors
69%	13.5%	32%	0	59%	13.5%	23%	13.5%


**Project Conclusion and Assessment of the Potential Impact to Healthcare.**

**Results** from the study identify that error rates in recording NEWS on the current paper based system are excessively high- **with 59% of observations having errors that could significantly impact patients** (Type 2 errors). By introducing a semi-automated digital version, the opportunities for human errors (relating to transcription, illegibility, miscalculations, omissions etc) are minimised so that overall error rate (for Type 2 errors) was **reduced from 59% to 13.5%** in this study. When delays in time are assessed- use of a digital system reduced these delays from 23% to 13.5% which may be a result of improved efficiency providing staff with time to conduct NEWS assessments more quickly and effectively using a digital system.

## References:

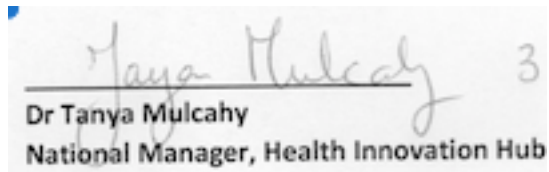
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Signatures:



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Ronnie McDermott, HSE, National Medical Device Equipment Advisor, Acute Services.



Dr Tanya Mulcahy  
National Manager, Health Innovation Hub