

## EXECUTIVE SUMMARY

# Remote Patient Monitoring (RPM) in Children on Long Term Ventilation (LTV) at Home: A Feasibility Study

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# Executive Summary

Children who are dependent on technology to survive, including those on Long Term Ventilation (LTV), are a group who due to the nature of their medical conditions and level of support required, frequently spend extended periods of time in hospital. These children often live short lives and therefore their quality of life is paramount. Their quality of life can be negatively impacted by long periods spent as an inpatient in hospital.

To confront this problem and optimise the quality of life for these children and their families required an innovative solution, which was proposed in the form of Remote Patient Monitoring (RPM) technology. RPM is being increasingly utilised in both adult and paediatric healthcare settings to offer various benefits including early detection of deteriorating patients and provide an ambulatory option to allow patients to spend less time in hospital and deliver more of their care at home.

The number of children who are dependent on medical technology is increasing and the resources needed to support them are significantly greater than most other paediatric patient populations. The “Remote Patient Monitoring in Children on Long Term Ventilation at Home: A Feasibility Study” project is a service evaluation to assess if Masimo RPM technology could be used in children on LTV in the home environment as part of a virtual ward setup to reduce the frequency and length of hospital admissions.

This project was first initiated in 2022 through a Fellowship co-funded by Oxford University Hospitals NHS Foundation Trust (OUH) and the Thinking of Oscar Charity where RPM was identified as a technology which could have a positive impact in an acute paediatric setting. The work undertaken in this Fellowship (September 2024 for 12 months) funded by OUH has been led by Dr Matt Ryde (Senior Clinical Fellow in Paediatric Critical Care with Digital Innovation) and supported by Dr Helen Turnham (Paediatric Critical Care Consultant).



**2,300+** children and young people in the UK require LTV<sup>1</sup>



## References

- <sup>1</sup> Barker N, Sinha A, Jesson C, Doctor T, Narayan O, Elphick HE. Changes in UK paediatric long-term ventilation practice over 10 years. Arch Dis Child. 2023 Mar;108(3):218-224. doi: 10.1136/archdischild-2021-323562
- <sup>2</sup> Unplanned Admissions in Children on Long-Term Ventilation (LTV) in Oxfordshire - Audit (2020-2024), Dr Matt Ryde, 27062025 (OUH Internal link)
- <sup>3</sup> [Cost-Effectiveness of Pediatric Central Venous Catheters in the UK: A Secondary Publication from the CATCH Clinical Trial](#)

For this project, three children dependent on LTV and their parents were enrolled. These children and their families were well known to the Paediatric Critical Care, Respiratory, Palliative Care and Community Nursing teams in Oxford as they were frequently admitted to hospital (often critical care) with respiratory exacerbations. The parents were provided with Masimo Radius PPG sensors and over a period of three months they were instructed to apply the devices when there was any concern that their child was unwell and to leave the RPM devices in-situ for 72 hours (regardless of whether they recovered rapidly or were reviewed/admitted to hospital). In addition, the parents were encouraged to apply the devices for the same period when their child was well to gather further vital signs data. Masimo devices enable remote monitoring via Bluetooth with a mobile phone or tablet associated application which then facilitates live data collection and alerts clinicians responsible for the children's care via a web-based dashboard enabling monitoring of multiple patients simultaneously.

The vital signs data was analysed retrospectively to assess the quality of data, particularly with regards to consistency of measurement over the data collection period. If the devices were applied prior to the child being admitted to hospital, the data was interrogated in a more detailed fashion to assess if there were any trends that could have helped identify clinical deterioration at an earlier stage. In addition to the quantitative assessment undertaken, the user experience of parents using the devices was also obtained at the end of the study period.

Over 330 hours of vital signs data was collected during the study. The total time where all vital signs data was missing was less than 3% of the total, with respiratory rate only missing for another 5% due to requiring a longer averaging time following disconnections. The Bluetooth connection was robust with no contribution to data outage and in one case the backfill of data once Wi-Fi connection had been restored was demonstrated successfully for several hours of data. An exploratory review of trends suggestive of clinical deterioration was possible with two datasets and resulted in some potential trends being identified that could have led to earlier intervention. The overall experience of parents using the Masimo Radius PPG sensors and SafetyNet was positive. They reported that the sensors were easy to set up and pair with the application on the phone/tablet and the sensors were well tolerated by the children when in use.

This study demonstrates that the use of Masimo Radius PPG sensors in combination with the SafetyNet dashboard is feasible in the home environment for children on LTV. This technology utilised within a virtual ward environment could result in a reduction in hospital stay through minimising delays in discharge and form part of a step-up model of care in the community involving other interventions such as chest physiotherapy and remote antibiotic prescribing.

This project has also provided an opportunity for the team at OUH to develop a pathway within the Paediatric Hospital at Home service in Oxford which aims to support children on LTV in the community and prevent hospital admission. This will be piloted over the winter months towards the end of 2025.



From 2020-2024, children on LTV spent a total of **774 days** in hospital in Oxfordshire<sup>2</sup>

Of these, **75%** were due to respiratory illness<sup>2</sup>

Unplanned admissions to both ward & critical care **increased by 270%** between 2020 - 2024.



**£1,743 per day** for a basic pediatric intensive care bed<sup>3</sup>



**100% of parents** reported a **positive experience** in using remote monitoring devices



## Further information

For more information about this executive summary,  
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