

Temporal trends in virtual care data may influence program staffing and design

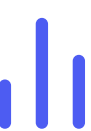
Introduction

- Launching a virtual care program requires organizations to anticipate patient flow and clinician workload, so it can be appropriately staffed as the program scales.
- Common nursing activities include admitting and discharging patients and responding to vital sign and technology adherence alarms.
- More nuanced understanding of peaks and troughs in workload during virtual care may assist with workforce planning when setting up and expanding virtual care programs.
- We mapped these common activities to typical shifts (day/night, weekday/weekend), hypothesizing that workload patterns would vary between these times.

Methods

- We analyzed admission, discharge and alarm rates in 1,025 admissions of 932 patients using the Current Health platform.
- Patients were enrolled in virtual care programs from four American healthcare organizations for hospital at home, post-acute care and chronic disease management.
- Patients aged 21 and over, who activated their wearable monitoring device within 72 hours of admission and supplied at least 24 hours of monitoring data were included.
- Data were assessed for normality (visual inspection, Shapiro-Wilk) and were non-parametric. They are presented as median (IQR), compared using one-sample Chi Squared, Wilcoxon Rank Sum. Significance was set at $p < 0.05$.

Results



Ages ranged from 24–101 years, (median 69 (IQR 57–79) years).



816 (80%) were admitted and 810 (79%) were discharged on weekdays between 8am–8pm (Figure 1).



10% of patients contributed **53%** of vital sign and **46%** of adherence alarms.



79% of patients triggered **29,280 alarms** (74% vital sign, 26% adherence).



Patients were monitored for a median 8 (IQR 4–15) days, transmitting a total of **228,487 hours of data** between 8/1/21 and 8/1/22.



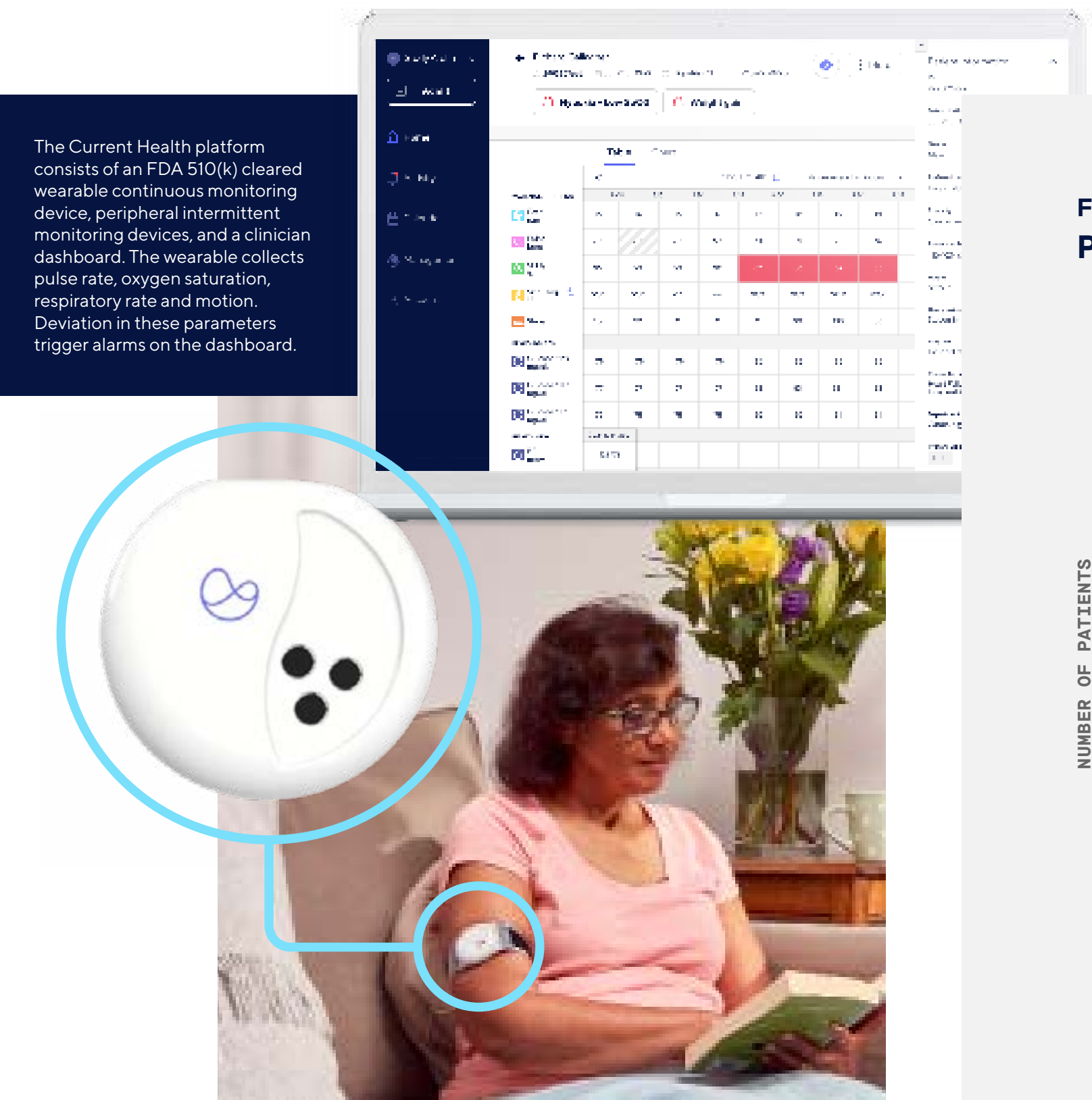
Patient numbers increased Monday to Thursday. Most discharges took place on Friday, with fewer patients being monitored on weekends (median 7 vs. 6 patients, $p = 0.004$).



Median wearable adherence was 90 (73–96) %, highest on the day of admission, and on weekends, and lowest on day 7 (Figure 2).



There were **significantly more vital sign alarms during the day**, both in absolute numbers (11,526 vs. 10,232, $p < 0.0001$) and per patient (median 0.8 vs. 0.7, $p = 0.004$), and **significantly more technical adherence alarms overnight** (absolute numbers only, 3,919 vs. 3,603, $p = 0.0002$).



Conclusions and recommendations

- The highest clinical workload is weekdays, 'in hours', so virtual care programs should be staffed accordingly.
- The 10% of patients who generated half the alarms should be identified early for additional support.
- Alarm thresholds should be set to accommodate the physiological challenges of activities of daily living.
- Wearable adherence was high, but prompting patients in the afternoons, and on day 6, to charge their wearable and wear it overnight will improve data quality and reduce the number of adherence alarms.
- Future research should focus on understanding and predicting patient trends by clinical condition, demographics and program goals.

FIGURE 1. PATIENT ADMISSIONS BY DAY OF THE WEEK

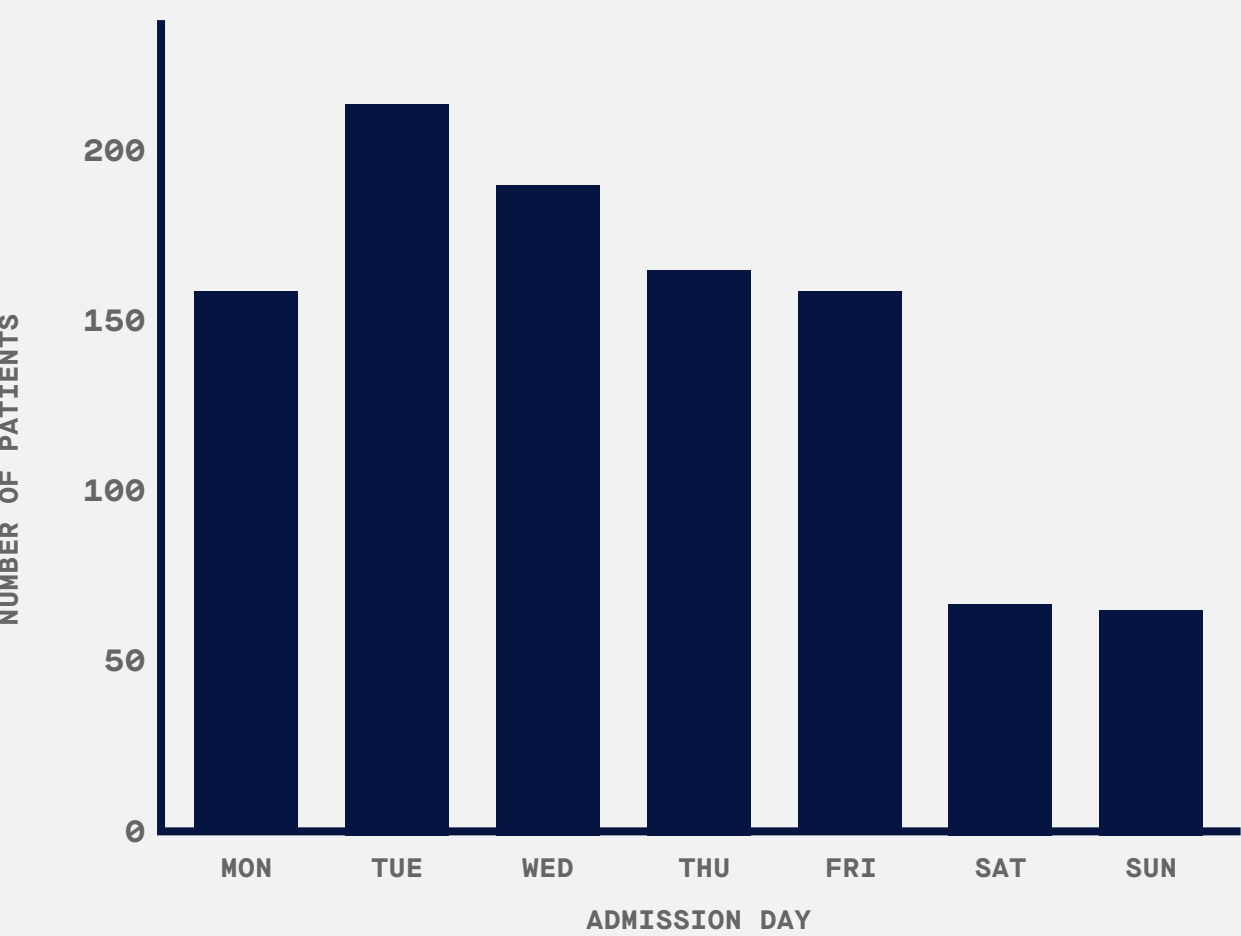


FIGURE 2. PATIENT ADHERENCE TO WEARABLE MONITORING BY DAYS SINCE ADMISSION

