

Abstract: P1512

Title: MAPPING THE PRODRIMAL STAGE OF VASO-OCCLUSIVE CRISES: A PATIENT EXPERIENCE AND WEARABLE BIOMETRICS-DRIVEN APPROACH

Abstract Type: Poster Presentation

Topic: Sickle cell disease

Background:

Vaso-occlusive crises (VOCs) are acute pain episodes experienced by patients with sickle cell disease (SCD), potentially leading to severe end-organ damage in the long-term and shortened lifespans. Early detection and prevention are critical to improving patients' quality of life and long-term outcomes, and this in turn requires an in-depth understanding of the prodromal stage to drive pre-emptive intervention.

Aims:

To better describe the key patient-reported features of the prodromal stage of VOCs in patients with SCD and explore the relationship with physiological and passively collected wearable metrics.

Methods:

Wearable data was captured in an automated, continuous manner for an extract of 83 patients with 3 or more self-reported VOCs, following informed patient consent. A CE-marked wearable smartwatch was used to capture metrics (activity, sleep, heart rate (HR)) for the analysis of potential prodromal changes. This was calculated as a pooled analysis of datapoints captured at baseline vs. during the 4-day prodromal period. 9 patients who reported experiencing frequent VOCs also took part in a workshop to explore the key features of the prodromal stage. Insights around the typical period of build-up to a VOC and associated signs and triggers were recorded.

Results:

The duration of the prodromal stage varied between patients, at 5-7 days for 33% (3/9) of patients, 2-3 days for 22% (2/9), and 1 patient reporting that this was typically 1 day at most. 3 patients did not specify a time frame for the prodromal stage. While pain locations during the prodromal stage varied, the spread to additional regions was a sign of progression to a full VOC in 56% (5/9) of patients.

Key similarities were identified within common signs and triggers, including both physical and emotional stress across all 9 (100%) patients. Fatigue or sleep levels were highlighted by 67% (6/9) of patients. Pooled analysis of metrics linked to stress and overexertion within the 83-patient wearable cohort identified statistically significantly higher sleep (74 vs. 69 bpm, $p < 0.001$) and active (77 vs. 64 bpm, $p < 0.001$) heart rates during the prodromal stage in comparison to patient baselines.

Figure 1. Key patient-reported VOC triggers and changes in linked metrics at baseline in comparison to the 4-day VOC prodromal stage. (*denotes statistically significant difference between baseline and prodromal means at a p=0.000 level)



Summary/Conclusion:

While common signs and triggers have been identified by patients, variability exists in prodromal periods and symptoms both between patients and within each patient's experience from crisis to crisis. Key biometrics linked to stress – a critical and universally flagged VOC trigger within the patient workshop cohort – have shown changes over the prodromal stage in comparison to patients' baselines. These biometrics will therefore form a core focus in future work to define the central predictive variables, map any variations at different points within the prodromal period, and establish differences between patient groups.

Keywords: Sickle cell disease, Sickle cell patient, Vasoocclusive crisis