

DETECTING EARLY SIGNS OF PATIENT DETERIORATION AT HOME USING WEARABLE SENSOR DATA: A ONE-CLASS CLASSIFICATION APPROACH

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1. Introduction

Patient care is increasingly transferred from hospitals to patients' homes. It is important that signs of remote deterioration are detected in an early state, such that healthcare professionals can act timely. However, developing models that can detect this is challenging, because most datasets only have few events of patient deterioration, and one model may not fit all patients[1]. Personalized one-class classification (OCC), which detects abnormalities, may help to overcome these challenges.

2. Objectives

To investigate whether early detection of patient deterioration at home using wearable sensor data could be approached as a personalized OCC problem.

3. Methods

Two datasets were used containing data of discharged medical (N=200) and postsurgical patients (N=350), who had worn a wearable sensor for up to fourteen days at home. Local Outlier Factor (LOF) and Isolation Forest (IF) were used as OCC techniques, which were compared with the Remote Early Warning Score (REWS)[2]. Input data were heart rate, respiratory rate, activity and a day-night feature.

4. Results

For medical patients, OCC outperformed the REWS. However, for postsurgical patients, the REWS outperformed OCC. Several clinical and technical reasons could explain the differences in performance. For instance, personalized OCC only works for patient populations for whom signs of deterioration exhibit abnormal characteristics. Furthermore, sensor data quality could largely affect the suitability of personalized OCC.

5. Conclusion

Depending on the clinical context and the used wearable sensor, early detection of patient deterioration at home using wearable sensor data may be approached successfully as a personalized OCC problem.

6. References

1. Blackwell JN, Keim-Malpass J, Clark MT, et al. Early detection of in-patient deterioration: one prediction model does not fit all. *Crit Care Explor.* 2020;2(5):e0116.
2. van der Stam JA, Mestrom EH, Nienhuijs SW, et al. A wearable patch based remote early warning score (REWS) in major abdominal cancer surgery patients. *Eur J Surg Oncol.* 2023;49(1):278-84.