PREDICTING GERIATRIC REHABILITATION STAYS OF ≤ 4 WEEKS AFTER HIP FRACTURE SURGERY: A MACHINE LEARNING APPROACH USING PHYSICAL ACTIVITY AND PATIENT DATA

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Introduction

In 2022, over 18,000 patients aged \geq 70 years were hospitalized for hip fractures in the Netherlands, with 50% requiring geriatric rehabilitation after surgery [1-3]. Increasing patient numbers, staff shortages, and rising pressure on healthcare budgets make adequate care challenging [4]. To address these challenges, early discharge and home-based rehabilitation for patients with a short predicted geriatric rehabilitation stay (\leq 4 weeks) may help, emphasizing the need for early prediction models.

Objectives

This study aims to develop machine learning (ML) models to predict a geriatric rehabilitation stay of ≤ 4 weeks in a skilled nursing home for older patients after hip fracture surgery, using seven days of continuously monitored physical activity data and patient characteristics.

Methods

This retrospective cohort study (January 2019-August 2024) included 100 patients. Patient characteristics and MOX1 accelerometer physical activity data from the first rehabilitation week were collected. Principal component analysis reduced the physical activity features. Eight ML models were developed using Bayesian hyperparameter optimization. For each model, accuracy, F1-score, and area under the receiver operating characteristic curve (AUC) were computed, and key predictive features identified.

Results

Support vector machines had the best performance (accuracy=0.95, F1-score=0.95238, AUC=0.97). Key predictive features included the principal components of the physical activity data; Age; Katz-ADL6 at hospital discharge; surgery type; and FAC at hospital discharge.

Conclusion

This study developed several ML models that accurately predicted a geriatric rehabilitation stay of ≤ 4 weeks in a skilled nursing home for older patients after hip fracture surgery.

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