

Fall Incidents in Nursing home patients: Development of a predictive clinical Rule (FINDER)

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Background

Fall incidents are common among nursing home patients.
Different tools have been developed to prevent fall incidents, but with unsatisfactory results.

Objective

To develop (part I) and validate (part II) a clinical rule (CR) that can identify nursing home patients at risk for a fall incident.

Methods

An observational, retrospective database study was conducted in two parts. In part I a CR was developed to predict the fall risk in nursing home patients (NH patients). Electronically available data regarding medication (number and type of medicines), laboratory data, patient characteristics and reports on fall incidents were collected. In part I the variables that could lead to increased fall risk were determined. Logistic regression analysis was conducted to identify the fall risk-variables in part I. With these, three CRs were developed (figure 1a). The overall prediction quality was assessed using the *Area Under the Receiver Operating Characteristics* (AUROC), and a cut-off value was determined for the predicted risk ensuring a sensitivity ≥ 0.85 . From the three CRs, one CR was chosen. This CR was validated in part II and the sensitivity, specificity, NPV and PPV were determined.

Part I: development

- Identification fall risk factors ($p \leq 0,05$)
- Multiple logistic regression model
- Overall prediction quality clinical rule (AUROC)

Part II : validation

- Validation of the chosen model (CR)
- Sensitivity, specificity, NPV and PPV

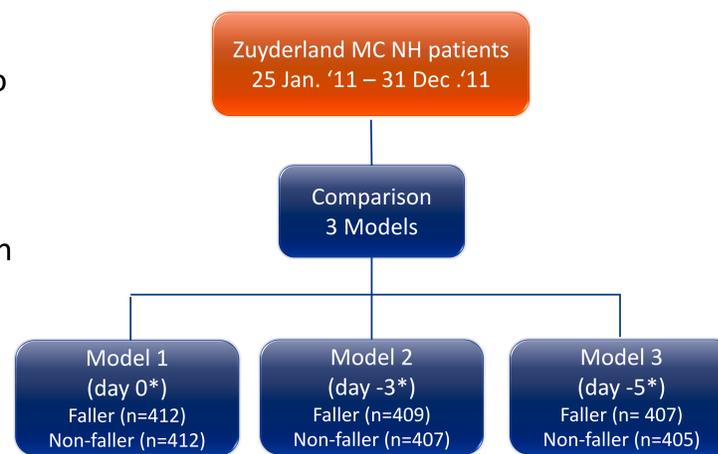


Figure 1a: development of a Clinical Rule
(*day 0: day of fall incident, day -3: 3 days prior to fall incident,
day -5: 5 days prior to fall incident)

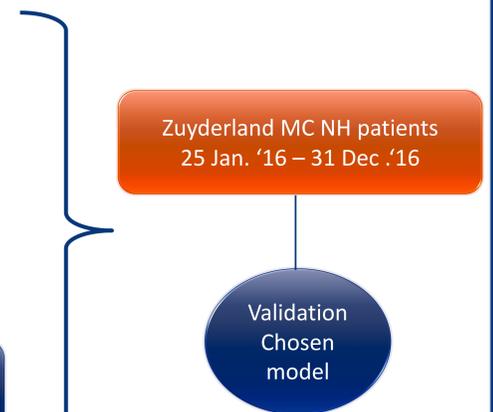


Figure 1b: validation of a Clinical Rule

Results

A total of 1668 (824 in part I, 844 in part II) nursing home patients from Zuyderland MC, The Netherlands, were included in the study. 11 fall risk-variables were identified in part I (table 1). Model 3 (fall risk prediction 5 days prior to the fall incident) was validated. The validated AUROC of the prediction model, obtained in part II, was 0,603 (95%CI 0.565-0.641) with a sensitivity of 83% (95% CI 79-87%), a specificity of 27% (95% CI 23-32%), a PPV of 53% (95% CI 50-57%) and a NPV of 62% (95% CI 55-69%).

Fall-risk = $1/(1+\text{Exp}(-\text{Linear prediction formula}))$

Fall-risk predictors in the linear prediction formula:

- V1 Gender (1 = male, 2 = female)
 - V2-3 Age
 - V4* Anti-dementia drugs (N06D)
 - V5* Antidepressants (N06A)
 - V6* Anti-epileptics (N03A)
 - V7* Antipsychotics (N05A)
 - V8* Hypnotics and sedatives (N05C)
 - V9* Urologicals (G04)
 - V10* Opioids (analgetics) (N02A)
 - V11* Anxiolytics (N05B)
- * Specific ATC code present or absent

Table 1: Fall risk predictive CR

Conclusion and Relevance

A clinical rule based on electronically available data only is insufficient to predict the fall risk in nursing home patients. However, the developed predictive clinical rule could serve as a basis for future research, since more data are made available electronically.