UV9291 Principles of Measurement

Seminar 3

Paper Presentation

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Article

Validation of the Minimum Data Set (MDS) Cognitive Performance Scale: Agreement with the Mini-Mental State Examination (1995)

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Introduction

Main problematic addressed

- Dementia of the Alzheimer's type is a major problem in nursing homes across the US (in 1995), affecting over 50% of nursing home residents, but information of their cognitive functions was limited and/or different across facilities.
- US congress (in 1987!) introduced obligation to complete a standardized assessment.
- MDS is the care assessment component.

Introduction

MDS:

7 direct measures of cognition:

- Short and long-term memory
- Recall or orientation items (season, location of room, staff names/faces, orientation to nursing home)
- Decision-making ability.

Indirect measures of cognition:

- Comatose status
- Communication skills (making self understood, ability to understand others)
- Performance of activities of daily living (ADL) (bed mobility, transfer, locomotion, dressing, eating, toilet use, personal hygiene, bathing).
- Problem behavior (wandering, verbal and physical abuse, socially inappropriate behavior), and level of continence.

Introduction

Problem with cognitive assessment test scores and MDS:

Unfeasible for use in nursing home populations due to

- Excessive length
- Need for highly skilled personnel for administration
- Excessive administration costs.

In other words: many threats to reliability of measurement!

Test Scores

CPS developed to address these issues.

- Selected MDS items with hierarchical 7-category scale (0-6) ranging from no cognitive impairment to very severe impairment (i.e. ordinal scale)
- Modelling based on two standard cognitive assessment instruments: MMSE and TSI.
- Scores are of two types:
  - Assessment of nurses of cognitive impairment (require some subjective assessment of patient)
  - Behavioural observations: long-term memory, orientation/recall items, additional ADL items (toileting, dressing, locomotion, personal hygiene, bathing), incontinence, disruptive behavior, medication use, and restraints.

Validation Procedures

- Evaluation of validity of the CPS against the MMSE (gold standard for identifying cognitive impairment).
- Random sample of 200 residentes from 8 nursing homes in North Carolina.
- Nursing homes selected with convenience sampling based on driving distance.

Validation Procedures

- Facilities with Alzheimer's Special Care Units (SCUs) were oversampled.
- Evaluation of agreement between absence/presence of cognitive impairment (based on MMSE cut point).
- Purpose of validation: Consideration for (improvement of) provision of care for nursing home residents, i.e. decision making.

Validation Procedures

- Reported interrater reliabilities for subjective items were .81, .88, .77, and .94, respectively.
- Raters were two medical students, a geriatric research nurse, and an epidemiologist.
- Correlation between the CPS and the MMSE raw scores was examined by the Spearman correlation coefficient.

Validation Procedures

- Subjects were then classified into two groups: (a) cognitively intact, or (b) cognitively impaired based on education-level-adjusted cut-points.
    - MMSE score of 23 or less and an education level greater than grade 8 and subjects with an MMSE score of 17 or less and an education level of grade 8 or less were classified as cognitively impaired.
    - The CPS cut point for cognitive impairment was a score of 2 or more.
- Sensitivity (true positive rate) and specificity (true negative rate) of the CPS in identifying cognitively impaired subjects as defined by the MMSE were calculated.
- The level of agreement between the CPS and the MMSE was expressed statistically with kappa coefficients of concordance

Validation Procedures

Types of validity evidence generated:

- Concurrent (convergent) and construct evidence pursued
  - Concurrent is pursued because convergence between CPS and the MMSE instruments is assessed using different techniques.
  - Construct evidence is also pursued, because MMSE is seen as gold standard and as a valid measurement of the construct of cognitive impairment. This is made clear in the approach used based on classification between impaired/not-impared.
- This evidence is seen as valid in the context of specific consequences desired:
  - Intention to standardize measurement of cognitive impairment in order to have better national-level information to make decisions related nursing homes (e.g. budget, personal preparation, etc).

Findings

- Spearman correlation between the MMSE and the CPS was r = -.863 ($p < .001$).
- Sensitivity and specificity suggest excellent level of diagnostic accuracy (also assessed using ROC curve, and as stated in the article).
- Kappa suggests that with low educational level of patient agreement by chance increases. Still level of agreement is acceptable.

*Missed some information about dementia patients.

Table 3. Measures of Sensitivity, Specificity, and Reproducibility (Standard Error) of the Cognitive Performance Scale (CPS) Stratified on Education Level ($N = 200$)

Cognitive Impairment	Sensitivity (*SE*)	Specificity (*SE*)	Kappa (*SE*)
High Education ($n = 138$) (MMSE≤23, CPS>1)*	0.90 (0.03)	0.95 (0.04)	0.85 (0.07)
Low Education ($n = 62$) (MMSE≤17, CPS>1)†	0.94 (0.03)	0.85 (0.10)	0.76 (0.12)

*Cut points for identification of cognitive impairment in subjects with more than grade 8 education.

†Cut points for identification of cognitive impairment in subjects with grade 8 or less education.