

Clinical testing of ePA-AC[®], a screening instrument to assess relevant signs and symptoms of nursing care dependency in acute care clinics

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1 Background

Valid nursing diagnostics is ineffective without the use of assessment and/or screening instruments (e.g. Gordon 1994; Ehrenberg & Ehnfors 1999; Bartholomeyczik 2003). Appropriate instruments developed for acute care are still missing to date. Therefore, the Department for Nursing Research and Development at the HSK, Dr. Horst Schmidt Klinik in Wiesbaden, Germany, has developed a screening instrument referred to as ePA-AC[®] (“*ergebnisorientiertes PflegeAssessment AcuteCare*” / outcome-oriented nursing assessment Acute Care), designed to assess nursing outcomes (cf. Hunstein, Dintelmann et al. 2005). The ePA-AC[®] has been developed to record the essential aspects of nursing care requirements in the acute setting and to measure their degree of severity. In its function as a screening instrument it collects signs and symptoms of nursing diagnoses and therefore supports the diagnostic nursing process, the measurement of selected nursing sensitive outcomes, and process control. Furthermore, ePA-AC[®] data can be used in terms of a NMDS (Nursing Minimum Data Set) as economic and epidemiological operating figures.

The ePA-AC[®] consists of 50 items in 10 categories (see table 1) and contains in reference to the International Classification of Functioning, Disability and Health (ICF, WHO 2001) data on activities and participation (N = 17 items), body functions (N = 16 items), body structures (N = 1 item), and contextual information (N = 16 items).

Table 1: ePA-AC[®] categories

ePA-AC [®] categories
Mobility
Hygiene & Dressing
Nutrition
Elimination
Cognition & Awareness
Communication & Interaction
Sleep
Respiration
Pain
Pressure sore & Wounds

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In the first step, the items were theoretically developed. The developed ePA-AC[®] alpha was subsequently put to the test on two wards for two months. In a structured confirmation process suggestions for the improvement of the coding manual as well as the items were collected. The results were integrated in the alpha version and tested on another two wards. This change between a theoretical and a practical phase was continued on altogether 10 wards until data saturation was achieved. Based on the results from this process the ePA-AC[®] beta was developed. The final beta version of ePA-AC[®] was put to use in 19 wards at the HSK and at the Kanton Hospital Uri (Switzerland). From March to July 2006, the relevant data for the clinical test were collected. The development of ePA[®] 1.0 Acute Care will be completed when all data are analysed.

2 Aims

Using structured nursing data provided by scientifically tested instruments is a prerequisite for clinical decision making. Hence, the ePA-AC[®] was examined for the degree of compliance with the following quality criteria: interrater reliability, internal consistency, construct validity, predictive validity, and sensitivity to change.

3 Methods

The design of the study was quantitative, prospective, non-experimental and multicentred. During March and June 2006, a comprehensive set of data was collected in a full sample of all patients in four wards of the HSK (cardiology, gastroenterology, accident & emergency and interdisciplinary intermediate care) and on two interdisciplinary wards of the Kanton Hospital Uri. The data came from both the anonymised ePA-AC[®] documentation as well as other data records of the electronic patient documentation. There is a sample comprising over 1,500 patients for the validity tests. For the testing of interrater reliability more than 230 ratings were carried out.

The construct validity was measured by hypothesis testing (cf. Streiner & Norman 2003). The CaseManagementScore (CMS[®]), theoretically developed from 10 ePA-AC[®] items and designed to reveal both patient abilities (in terms of activity and participation) and the likelihood of a post-discharge care deficit, was tested for predictive validity. This involved a comparison of the CMS[®] value and the actual use of post-discharge nursing care services.

For the test of the interrater reliability the agreement of the 115 valid rating pairs was examined depending on the scale level (dichotomous or ordinal scaled) with the chance corrected Cohen's Kappa (κ , Cohen 1960) respectively Cohen's quadratic weighted kappa

(κ_{qw} , Cohen 1968). Due to its paradox characteristics (Feinstein & Cicchetti 1990), the κ_{max} (Sim & Wright 2005) and prevalence-adjusted bias-adjusted Kappa PABAK (Byrt, Bishop et al. 1993) were calculated. The statistical significance of the κ values was checked with 95% confidence intervals (CI) (cf. Gardner & Altman 1986). In doing so, the lower CI limit was determined as $\kappa > .4$, which has been defined as „acceptable“ in accordance with the proposal of Landis & Koch (1977:165).

The procedure was examined by the Ethics' Commission of the University of Witten/Herdecke and declared to be ethically acceptable.

4 Results

Results for the interrater reliability as well as the construct validity and sensitivity to change has been calculated. The calculations for internal consistency and predictive validity are not yet completed.

Two further quality criteria, feasibility and practicability, could be determined through the design of the instrument development by continuously changing between the theoretical development, the practical trial and the revision of the instrument. Through this approach content and face validity are assured.

4.1 Interrater reliability

The Kappa coefficient of the 22 dichotomous items is between .267 (characteristics of a changed sleep-wake cycle¹) and 1.0 (tracheostomy, nutritional tube), see table 2. The proportion of the observed agreements ranges from 76.64% (ability to fall asleep) to 100.00% (tracheostomy, nutritional tube). N = 15 of the dichotomous items achieves with 95% probability a higher Kappa value than .400, N = 12 even a $\kappa \geq .500$. For N = 5 of the altogether N = 7 items which don't achieve the targeted significance level, the maximally achievable (observer) prevalence was below 5%.

The weighted kappa-coefficient of the 26 scaled items ranges between .557 (state of awareness & vigilance) und .962 (ability to urinate), the proportion of observed agreements is between 71.17% (pain intensity) und 92.17% (state of awareness & vigilance). Only N = 7 of the scaled items did not achieve the targeted significance level (lower limit of the 95%-CI $\kappa_{qw} > .4$).

The agreements of the two items pressure sore and wounds are not yet evaluated.

¹ For the interpretation of this κ -value the asymmetrical unbalanced distribution and therefore the influence of the first kappa-paradox has to be considered (Feinstein & Cicchetti 1990).

Table 2: Interrater reliability: κ and κ_{qw} of agreement (extract)

Item	Kappa	P _O (%)
Tracheostomy	1.000 (κ)	100.00
Self-care ability to perform own toileting activities – Urine	.962 (κ_{qw})	88.60
Self-care ability activity / locomotion (e.g. from bed to chair)	.920 (κ_{qw})	83.48
Self-care ability to perform dressing activities (upper part of the body)	.914 (κ_{qw})	79.13
Urinary continence	.908 (κ_{qw})	92.06
Self-care ability to perform dressing activities (lower part of the body)	.902 (κ_{qw})	76.52
Ability to orientate oneself	.898 (κ_{qw})	90.27
Self-care ability to eat	.886 (κ_{qw})	82.46
Self-care ability to drink	.886 (κ_{qw})	84.35
Self care ability to perform personal hygiene activities (upper part of the body)	.881 (κ_{qw})	73.91
Self care ability to perform personal hygiene activities (upper part of the body)	.870 (κ_{qw})	76.52
Self-care ability: mobility / change of positioning (in bed, chair etc.)	.840 (κ_{qw})	72.17
Signs and symptoms of acute dyspnoea	.798 (κ)	91.30
Self-initiated activities to promote wellness, recovery, and rehabilitation (Adherence)	.704 (κ)	90.18
Activities based on professional counselling to promote wellness, recovery, and rehabilitation (Compliance)	.671 (κ)	90.09
Signs and symptoms for an altered walking pattern	.663 (κ)	84.54
Awareness/Vigilance	.557 (κ_{qw})	92.17
Signs and symptoms for an altered ability to fall asleep / to sleep through	.402 (κ)	76.64
Signs and symptoms for an altered sleep-wake cycle	.267 (κ)	81.48
P _O = Proportion of observed agreements κ = unweighted kappa κ_{qw} = quadratic weighted kappa		

4.2 Validity

Sampling: Complete sample of all patients from four wards of HSK, Dr. Horst Schmidt Klinik, Wiesbaden, Germany, (cardiology, gastroenterology, accident & emergency and interdisciplinary intermediate care) with N = 1,093 patients as well as three interdisciplinary wards of the Kanton Hospital Uri in Altdorf (Switzerland) with N = 439 patients. The data collection was carried out during March and June 2006.

4.2.1 Construct validity

In order to measure construct validity, ePA-AC[®] score values were compared to other data which were assumed to be related to nursing care dependency (known groups technique, Streiner & Norman 2003).

Three examples are given below:

Convergent validity I: Patients who have cared for themselves at home show significantly higher (i.e. “better”) values in the ePA-AC-CMS[®] (CaseManagementScore) than patients who were cared for at home (Kruskall-Wallis test $H = 225$, $df 3$, $p < .0001$, cf. figure 1).

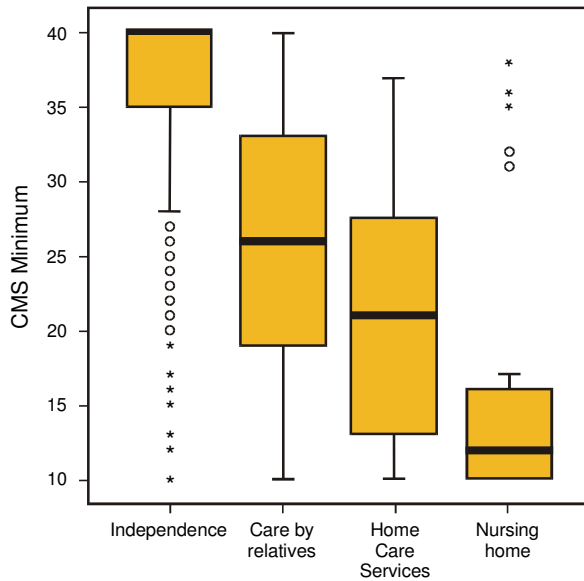


Figure 1: Correlation between care before hospital admission and nursing care dependency (ePA-AC-CMS®)

Convergent validity II: There is a significant correlation between the ePA-AC score values and the time expenditure for nursing interventions triggered by the nursing care dependency, e.g. giving support during food intake, giving support during dressing etc. (linear regression, $R^2 = .625$, R^2 adjusted = .625, Beta-coefficient = -8.261, 95% CI -8.611 to -7.912, cf. figure 2). The time expenditure was collected through LEP Nursing 2.0, a workload measurement system from Switzerland (Brügger, Bamert et al. 2002).

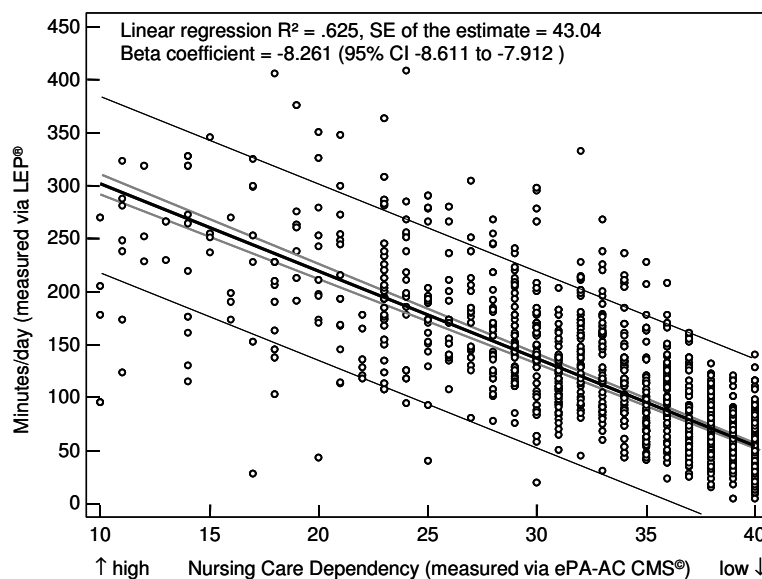


Figure 2: Time expenditure for nursing interventions triggered by the nursing care dependency vs. ePA-AC CMS®

Discriminant validity: There is little correlation between the ePA-AC score values and the time expenditure of the interventions triggered by medical diagnostics and therapy, e.g. care of an operation wound, replace surgical dressings, infusions etc. (linear regression, $R^2 = .020$, R^2 adjusted = .019, Beta-coeff. $-.962$, 95% CI -1.332 to $-.593$, cf. figure 3).

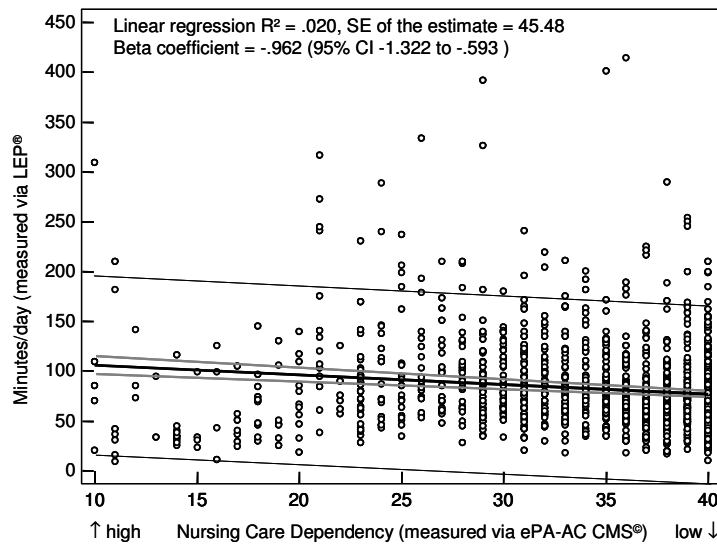


Figure 3: Time expenditure of interventions triggered by medical diagnostics and therapy vs. ePA-AC CMS[®]

4.2.2 Sensitivity to change

A valid screening instrument should be able to measure changes. Therefore, the following hypothesis was examined: an operation (external criterion) impairs the self-care abilities. This is reflected by postoperative lower values of the CMS[®] which measures abilities in terms of activities and participation.

Result: The CMS[®] values of the first postoperative days are significantly lower than the pre-operative values (Wilcoxon-Ranksum test $z = -8.57$, $p < .0001$, $N = 155$), the values for the day of discharge are significantly higher than the postoperative values ($z = -9.63$, $p < .0001$, $N = 186$), cf. table 3.

Table 3: ePA-AC[®] - Sensitivity to change

CMS pre-op vs. post-op	N	Rank sum
Pre-op > Post-op	104	6106
Pre-op < Post-op	8	221
Pre-op = Post-op	43	–

N = 155	CMS-Median (95%-CI)
Pre-op	40 (40 to 40)
Post-op	36 (34 to 37)

CMS post-OP vs. day of discharge	N	Rank sum
Post-op < Discharge	127	8735
Post-op > Discharge	6	175
Post-op = Discharge	49	–

N = 182	CMS-Median (95%-CI)
Post-op	34 (33 to 36)
Discharge	39 (39 to 40)

5 Summary

Not all of the data has been analysed to date. However, if the first results stated here are considered a trend, it can be said that the ePA-AC[®] is a feasible and valid instrument which delivers reliable data for science and practice.

The intensive development phase of the ePA-AC[®] has shown that it is reasonable to test a new instrument in practice as soon as possible. This will ensure not only the scientific quality of an instrument but also its practicability and acceptance in nursing practice.

6 References

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