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Title: Validation of the Basel Extents of Rationing of Nursing Care Instrument

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Psychometric analysis of data from 957 nurses in five Swiss acute care hospitals enrolled in a larger study on hospital organization. An explanatory factor analysis with varimax rotation was used to investigate the instrument's internal structure; Spearman correlations were used to test relationships between implicit rationing and two related concepts; and Cronbach's alpha and inter-item correlations were used to test the reliability of the total scale and extracted subscales.

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between implicit rationing as measured with the BERNCA and the perceived adequacy of nursing resources as measured by the Nursing Work Index-Revised, but not between the instrument and patient-to-nurse ratios. Cronbach's alphas (0.62 to 0.93) and inter-item correlations (0.39 to 0.66) indicated internal consistency and homogeneity.

Discussion: The initial data supports the validity and reliability of the BERNCA instrument.

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Validation of the Basel Extents of Rationing of Nursing Care Instrument

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Keywords: Healthcare rationing; health resources; nursing care.

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Molly C. Dougherty, PhD, RN, FAAN
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Basel, Jan 1st, 2007

Dear Dr. Daugherty

It is an honor to submit the paper

Validation of the Basel Extents of Rationing of Nursing Care Instrument

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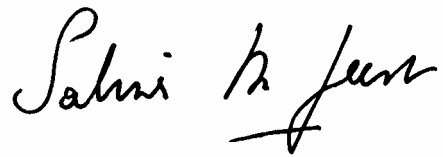
to *Nursing Research*. This instrument was developed as part of the Swiss part of the INTERNATIONAL HOSPITAL OUTCOMES STUDY in collaboration with the Center for Health Policy and Outcomes Research of the University of Pennsylvania to assess the extent of implicit nursing of nursing care in Swiss acute care hospitals.

None of the authors have conflict of interest to declare in relation to this paper. The research was conducted after review by the respective ethical committees of the Cantons of Switzerland where the research was conducted.

We thank you and the reviewers in advance for the attention given to this paper and look forward to receiving your feedback.

2

Sincerely

A handwritten signature in black ink that reads "Sabina De Geest". The signature is written in a cursive style with a prominent initial 'S' and a long, sweeping underline.

Sabina De Geest, PhD, RN
Professor of Nursing
Institute of Nursing Science
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Switzerland

28.12.06

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3 nurses limiting the nursing care individual patients receive in some instances. The Basel Extents of
4 Rationing of Nursing Care (BERNCA) instrument was developed to facilitate research assessing and
5 comparing the degree to which specific nursing measures are being restricted in acute care hospitals
6 because of lack of resources.

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10 study on hospital organization. An explanatory factor analysis with varimax rotation was used to
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12 between implicit rationing and two related concepts; and Cronbach's alpha and inter-item correlations
13 were used to test the reliability of the total scale and extracted subscales.

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15 domain adequately and that its questions were fully comprehensible. Single-factor and five-factor
16 solutions confirmed the instrument's internal structure and indicated that relationships between the
17 observed aspects of implicit rationing were congruent with the theoretical framework. An expected
18 association was found between implicit rationing as measured with the BERNCA and the perceived
19 adequacy of nursing resources as measured by the Nursing Work Index-Revised, but not between the
20 instrument and patient-to-nurse ratios. Cronbach's alphas (0.62 to 0.93) and inter-item correlations
21 (0.39 to 0.66) indicated internal consistency and homogeneity.

22 Discussion: The initial data supports the validity and reliability of the BERNCA instrument.

1 Background

2 Global healthcare costs are rising dramatically, alongside scientific and technological
3 advances, demographic trends and epidemiological shifts (OECD, 2003). Such costs often
4 surpass the means of governments, insurers, and users to finance them. To contain the growth
5 of healthcare expenditures, several cost saving strategies have been implemented at national,
6 regional, and local levels across the developed world. These include: a) hospital budget cuts,
7 which often negatively impact patient-to-nurse ratios and staff skill mixes; b) changes in
8 hospital utilization through reduction of the average length of stay, along with substitution of
9 outpatient for inpatient care (Buchan, Hancock, & Rafferty, 1997; Busse & Schwartz, 1997;
10 Decter, 1997; Maarse, Mur-Veeman, & Spreeuwenberg, 1997; Shamian & Lightstone, 1997;
11 Sochalski, Aiken, & Fagin, 1997); and c) efforts to maximize the cost-effectiveness of
12 medical practices (e.g. managed care) (Ward, 2005). These restructuring, reorganization and
13 reengineering strategies often lead to rationing of health care services (Bodenheimer &
14 Grumbach, 2002; Ward, 2005).

15 Rationing in medical care is defined as the limitation of resources, including money,
16 allocated to medical care, such that not all necessary care is provided to all patients as often as
17 recommended, but that these limited resources are distributed fairly (Bodenheimer &
18 Grumbach, 2002). *Explicit rationing* involves the distribution of limited resources
19 (therapeutic, medical, technical, or financial) in accordance with legal regulations and
20 guidelines. These specify who is responsible for decisions and which criteria are used to
21 allocate necessary interventions or procedures to patients. *Implicit rationing*, on the other
22 hand, involves the distribution of limited resources *without* such legal regulations, guidelines
23 or criteria. Here, the individual physician or nurse treating the patient bears the responsibility
24 for the allocation of available resources (Nocera, 2001; Sommer, 1999).

25 RATIONING OF NURSING CARE AND PRIORITY SETTING

1 In the absence of an accepted definition of “implicit rationing of nursing care,” it has
2 been framed here as “the withholding of or failure to carry out necessary nursing measures
3 due to inadequate time, staffing levels and/or skill mix” (Schubert & De Geest, 2003). Within
4 this definition, “necessary nursing measures” refers to the group of nursing actions
5 considered to be appropriate and needed for a patient by his or her nurse, based on that nurse’s
6 assessment of the patient’s health care needs, scientific evidence, reflected expert knowledge,
7 and patient preferences (Schubert & De Geest, 2003).

8 If nurses are forced to limit care due to lack of time, they must decide which of the
9 nursing measures have highest priority. Currently, knowledge, strategies, and factors
10 influencing this decision-making process are not well-understood (Hendry & Walker, 2004).
11 However, factors identified as influencing priority-setting in clinical nursing practice include:
12 1) factors within the nurse care work environment, such as the organization of nursing
13 practices at the ward level, and nurses’ autonomy and responsibility in providing care to their
14 patients; 2) clearly defined philosophy of care; 3) amount of available time and resources,
15 such as number of staff and their capabilities, or available equipment; 4) philosophy and aims
16 of the organization; 5) nursing care standards, including local and national guidelines,
17 policies, procedures and regulations; 6) patients’ values and priorities, urgency of health
18 problems, medical treatment plans and acuteness of patient condition; 7) number of problems
19 per patient; and 8) nurse caseloads (number of patients per nurse) (Hendry & Walker, 2004).

20 PRELIMINARY EVIDENCE ON RATIONING AND LIMITING OF NURSING CARE

21 Various survey data show that nurses do indeed have to limit the care they provide. In
22 the International Hospital Outcomes Study (IHOS) only 30-40% (n= 43,329) of nurses from
23 five countries (US, Canada, England, Scotland, and Germany) reported that there were
24 enough registered nurses to provide high quality care and enough nurses to perform all
25 required nursing tasks. Further, considerable numbers (from 10 to 54% across tasks and

1 countries) reported that a number of nursing activities considered markers of good nursing
2 care, such as oral hygiene, skin care, teaching patients and families, and comforting / talking
3 with patients had been left undone on their most recent shift (Aiken, Clarke, Sloane, Sochalski
4 et al., 2001). Sixty-four percent of 2,510 nurses working in acute care hospitals in the UK
5 reported feeling overworked, lacking the time to perform essential nursing tasks such as
6 addressing patients' anxieties, fears and concerns (19.7% all the time, 51.9% sometimes),
7 treating patients' symptoms and conditions (15.4% all the time, 33.1% sometimes), or
8 providing patients and relatives with necessary information (9% all the time, 50.7%
9 sometimes) (West, Barron, & Reeves, 2005).

10 A survey conducted in Switzerland showed that, due to a lack of time and resources,
11 30% of nurses (n=1.954) had to ration necessary nursing care and could ensure only that
12 patients were kept warm, well-fed, and clean. Time pressure affected primarily the area of
13 comfort and communication, followed by feeding and elimination functions, personal
14 hygiene, dressing and mobilization (Kuenzi & Schaer - Moser, 2002). Another Swiss survey
15 of 20 administrative leaders in Swiss acute care hospitals indicated that the lack of qualified
16 nursing personnel, especially in specialized fields, resulted in the omission of necessary
17 nursing therapies and discussions with patients (including providing patients with relevant
18 information), closing of beds and increases in error rates on a short term basis, concurrent
19 with decreases in care quality on a long-term basis (Kindschi, Held, Lechmann, Karges, &
20 Rechsteiner, 2001).

21 The available evidence indicates that, when nurses are short of time, care aspects most
22 associated with nursing, such as emotional support, individual discussions, and support of
23 patients in activities of daily living, are most likely to be neglected, while life-saving tasks,
24 medical-technical and therapeutic treatment are least likely to be neglected (Morin &
25 Leblanc, 2005; Schopper, Baumann-Hölzle, & Tanner, 2001a, 2001b). A study conducted in a

1 long term care setting showed that, when nurses were obliged to cut 30% of care hours, they
2 ensured that treatment and diagnostic methods were done as described and vital feeding and
3 elimination functions were maintained. Their care cuts included certain mobility and personal-
4 care activities, as well as communication with patients, family members and other
5 professionals (Morin & Leblanc, 2005).

6 FACTORS EFFECTING IMPLICIT RATIONING OF NURSING CARE AND QUALITY OF CARE

7 Much empirical work suggests an association between organisational traits (e.g.,
8 characteristics of the nurse work environment, staffing and resource adequacy, and quality of
9 overall care) and patient and nurse outcomes (Aiken, 2002; Aiken et al., 2002a; Aiken et al.,
10 2002b; Aiken & Sloane, 2002; McClure et al., 2002). On the basis of these results and a list of
11 factors believed to influence priority-setting in clinical nursing practice (Hendry & Walker,
12 2004) we hypothesized that higher levels of implicit rationing of nursing care would be
13 associated with poorer quality work environments (particularly the perceived adequacy of
14 staffing and resources, and the amount and type of resources needed for the daily care of
15 individual patients).

16 To assess the levels of implicit rationing of nursing care and its relationships to patient
17 and nurse outcomes in Swiss acute care hospitals – taking into account other major
18 organizational variables– we conducted the Rationing of Nursing in Switzerland (CH) Study
19 (RICH-Nursing Study) in 2003 and 2004. This study was funded by the Swiss Federal Office
20 of Public Health and is part of the International Hospital Outcomes Study (IHOS) (Aiken,
21 Clarke, Silber, & Sloane, 2003; Aiken, Clarke, & Sloane, 2002; Aiken, Clarke, Sloane, &
22 Sochalski, 2001; Aiken, Clarke, Sloane, Sochalski, & Silber, 2002). A new tool to measure
23 implicit rationing, the Basel Extents of Rationing of Nursing Care (BERNCA) instrument,
24 was developed.

1 The aim of the current study was to test its reliability and validity in accordance with
2 accepted standards¹ for educational and psychological testing (AERA, APA, & NCME,
3 1999). Four research questions and four hypotheses were developed to address four of five
4 possible validity dimensions for the instrument (Table 1).

5 **Methods**

6 **Design and sample**

7 Data from the RICH Nursing Study of 957 nurses working in a convenience sample of
8 five acute care hospitals, all located in the German speaking part of Switzerland, were used in
9 these analyses. Hospitals were included if they had more than 100 beds and offered surgical,
10 medical or gynaecological services, and if their directors there had provided written consent
11 for participation. All nurses working in the participating hospitals' medical, surgical or
12 gynaecological units were invited to participate. Inclusion criteria for nurses were: a Swiss
13 nursing diploma (DN I / DN II²) or an equivalent foreign nursing diploma; a minimum of
14 three months experience in direct patient care at the current hospital and of one month on the
15 current unit. Student nurses, nursing assistants, and float pool nurses were specifically
16 excluded.

¹ "Standards" are developed by the American Educational Research Association (AERA), American Psychological Association (APA) and the National Council on Measurement in Education (NCME)

² DNI = Diploma Level I three years and DN II = Diploma Level II four years training

1 **Variables and measurement**

2 IMPLICIT RATIONING OF NURSING CARE

3 The conceptual framework for the development of this instrument was developed from
4 the Swiss Red Cross framework for nursing education in Switzerland (SRK, 1992)³, which
5 describes the scope and responsibilities of nursing education and, to large extents, nursing in
6 Switzerland and the Swiss definition of professional nursing (Spichiger, Kesselring, Spirig, &
7 De Geest, 2004). Additionally, the instrument's construction drew heavily on the clinical
8 expertise of members of the research team. An initial list of 20 items was generated across
9 five dimensions.

10 The resulting item list was sent to qualified nursing specialists from the German
11 speaking part of Switzerland, including employees and students of the Institute for Nursing
12 Science (University of Basel), nursing experts (nurses with an advanced education in nursing
13 (Level 2) and nurses (diploma DN I/II) working in direct patient care in hospitals. These
14 experts were asked to indicate whether all significant dimensions of the concept of implicit
15 rationing of nursing care were included, as well as whether all content was relevant, the
16 formulation was clear and the content domain adequately represented. Two of the items were
17 rephrased on the basis of this feedback.

18 The final scale contained 20 questions distributed on five dimensions: 1) Activity of
19 Daily Living (ADLs) (6 questions, 1a-1f), 2) Caring & Support (2 questions, 2a, 2b), 3)
20 Rehabilitation & Instruction & Education (4 questions 3a-3d), 4) Monitoring & Safety (5
21 questions 4a-4c) and 5) Documentation (3 questions 5a-5c) (see table 3). Nurses assessed

³ Swiss Red Cross framework for nursing education in Switzerland (SRK, 1992) describes the scope and responsibilities of nursing education and to a large extent nursing in Switzerland as follows: 1) support of patients in the activities of daily living (ADLs); 2) support of patients in crisis situations and during the dying process; 3) participation in preventive, diagnostic and therapeutic interventions; 4) participation in prevention of illnesses and accidents as well as in health promotion and integration programs; and 5) improvement of the quality of care and the development of nursing as a profession, as well as collaboration in research projects.

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1 how often they had been unable to carry out each of the specified necessary nursing tasks
2 within the last seven nursing shifts, using the 4-point Likert scale (never = 0, rarely = 1,
3 sometimes = 2, often = 3).

4 The BERNCA was further pilot tested in two phases. In the first phase, 10
5 undergraduate students of the Institute of Nursing Science (University of Basel), all of whom
6 were working in direct patient care in German speaking Swiss acute care hospitals, evaluated
7 the clarity and comprehensibility of the items' wording. Subsequently, a group interview was
8 conducted with four of the respondents to discuss these points further. As a result a number of
9 minor changes were made. In a second phase, the BERNCA was given to 14 nurses from one
10 hospital to evaluate the clarity of the questions and wording. No further changes were
11 required.

12 VARIABLES USED TO TEST HYPOTHESES (Table 1)

13 PERCEIVED ADEQUACY OF NURSING RESOURCES, the nurses' perceptions of staffing and
14 resource adequacy and of the amount and type of resources needed for the daily care of
15 individual patients were measured with the "nursing resource adequacy and autonomy"
16 dimension of the Nursing Work Index-Revised (NWI-R). The NWI-R has been revised
17 several times. The RICH Nursing study used the version from the IHOS study (Aiken, Clarke,
18 & Sloane, 2002; Aiken & Patrician, 2000; Lake, 2002), containing 51 questions, each of
19 which used a 4-point Likert scale (ranging from "strongly agree" to "strongly disagree") to
20 record the extent to which each element identified was present in the respondent's current job.
21 Because of commonalities of less than 0.30, 17 of the questions of the NWI-R were excluded.
22 The remaining 34 questions were distributed over three subscales: 1) Nursing leadership and
23 professional development 2) Nursing resources and autonomy; and 3) Interdisciplinary
24 collaboration and competence. Because available evidence indicated that a particularly
25 significant relationship would exist between perceived resource adequacy and implicit

1 rationing of nursing care, this study used only the nursing resources and autonomy dimension
2 of the NWI-R (mean range 0-4, Cronbach's alpha 0.85) to investigate the relationships
3 between the BERNCA and other variables.

4 PATIENT-TO-NURSE RATIO, the number of patients each nurse was personally
5 responsible for on the last shift worked was measured using an item developed for the IHOS
6 study (Aiken et al., 2003; Aiken, Clarke, & Sloane, 2002; Aiken, Clarke, Sloane, & Sochalski,
7 2001; Aiken, Clarke, Sloane et al., 2002).

8 All instruments from the IHOS used in the RICH Nursing study were translated from
9 English to German and then back to English by native speakers using the adapted Brislin
10 protocol (Jones, Lee, Phillips, Zhang, & Jaceldo, 2001).

11 **Data collection & Data management**

12 Data collection was consecutively conducted in the five participating hospitals
13 between fall 2003 and summer 2004. Nurses were surveyed voluntarily and anonymously. All
14 nurses who fitted the inclusion criteria were invited to fill out the nurses' questionnaire. The
15 questionnaires were distributed by the research team and reference nurses on the respective
16 units. Once completed, they were deposited in closed boxes located centrally on each of the
17 participating units for the four weeks following their distribution. Informed consent for nurses
18 was implied by the completion and return of the questionnaires. Completed questionnaires
19 were scanned using Teleform software (Hardin, Woodby, Crawford, Windsor, & Miller,
20 2005). Data quality was verified by a member of the research team. To assure data quality, a
21 portion of the forms were checked manually.

22 Approval was obtained from the four local ethics committees responsible for the five
23 participating hospitals.

1 **Data analysis**

2 The data analysis procedure was guided by research questions und hypotheses
3 formulated to test the validity and reliability of the BERNCA (Table 1). Descriptive statistics
4 (frequencies, medians, interquartile ranges (IQR), means, standard deviations (SD), variances,
5 graphs, and cross-tabulations) were used to depict the nurse sample and to investigate
6 response processes, possible systematic answer patterns, missing values and measurement
7 errors. Cronbach's alpha and inter-item correlations were used to test the reliability of the
8 instrument's overall scale and extracted subscales.

9 To evaluate the internal structure of the BERNCA various factor extraction types and
10 rotation methods were tested. These showed that an explanatory orthogonal factor analysis
11 with varimax rotation was the most appropriate method to test the internal structure of both
12 instruments. Bartlett's Test of Sphericity, the Kaiser Meyer-Oblin Test (KMO) of sampling
13 adequacy and individual Measurers of Sampling Adequacy (MSA) were used to test if there
14 were sufficient numbers of significant correlations among the items to justify a factor
15 analysis. The extraction of factors was based on eigenvalues, scree plots, and conceptual
16 considerations. Items with multiple loadings were assigned either to their highest-loaded
17 factors or to those on which they fit most stably among the loaded items.

18 FACTOR ANALYSIS OF THE BERNCA: The explanatory factor analysis with varimax
19 rotation showed three initial factors with eigenvalues greater than one (Kaiser Guttman rule)
20 (Backhaus, Erichson, Plinke, & Weiber, 2003). However, one dominant factor was reflected
21 in each eigenvalue (8.4) and screeplot. Based on the conceptual framework and clinical
22 considerations we also performed a factor analysis specifying a 5-factor solution, then
23 calculated the mean of each factor to yield subscale scores. To reflect the presence of a single
24 dominant factor, we also calculated an overall rationing score, which was the mean of the 5
25 subscale scores.

1 Spearman correlations with two-sided significance levels were used to test the
2 relationship between the BERNCA (entire scale, subscales) and the two related concepts
3 *nursing resources and autonomy* and *patient-to-nurse ratio*.

4 Statistical data analyses were performed using the SPSS 13 software package (SPSS
5 for Windows, Rel. 13. 2001. Chicago: SPSS Inc.).

6 **Results**

7 Nine hundred fifty-seven, or 67 percent, of the 1435 nurses included responded. The
8 included nurses were predominantly female (91 %), aged 20 to 30 years (43%), and born in
9 Switzerland (78%). On average, they had worked 10.3 years as a nurse, 7.5 years in their
10 particular hospital, and 5.7 years in the current unit. Thirty-two percent had completed a
11 specialized, graduate, and postgraduate certification or degree (table 2).

12 **Validity and Reliability of the BERNCA**

13 Psychometric properties of the BERNCA were explored by assessing five questions and four
14 hypotheses (table 1).

15 EVIDENCE BASED ON TEST CONTENT (TABLE 1, Q 1-2)

16 As previously discussed in the description of the scale development, evidence based
17 on test content was established through expert judgments of 20 nurses. These specialists
18 confirmed that the BERNCA represented the domain of implicit rationing of nursing care, that
19 no significant content had been omitted and that the included questions were relevant. Further
20 pilot testing was also conducted as discussed previously.

21 EVIDENCE BASED ON RESPONSE PROCESS (TABLE 1, Q 3-4)

22 While it was not possible to ask the respondents about their thought processes in
23 answering the questions (given that the surveys were anonymous), we assessed each

1 individual question, the entire scale, and subscales in relation to missing values and specific
2 patterns of responses. A low frequency of missing values among items was observed (1.3% -
3 5.7%). Positively skewed distributions were observed in fifteen of the twenty item response
4 sets. The means ranged from 0.20 (SD 0.47) (item 1e) to 1.30 (SD 0.83) (item 2a).

5 EVIDENCE BASED ON INTERNAL STRUCTURE (TABLE 1, H1)

6 We explored evidence based on internal structure using explanatory factor analyses.
7 Since each of the questions represents an aspect of implicit care rationing we expected a
8 moderate to strong relationship between the individual questions and the concept of implicit
9 rationing of nursing care. The one-factor solution confirmed this expectation. All twenty
10 observed items showed stable to very stable factor loadings ($> .50$)⁴, indicating a strong
11 relationship between the observed items and implicit rationing of nursing care. The one-factor
12 solution accounted for 42% of the total item variance (eigenvalue: 8.50).

13 On the basis of conceptual and clinical considerations, including the importance of
14 identifying any differences in the extent of implicit rationing of nursing care among the five
15 dimensions, we also arrived at a five-factor solution. These factors ((1) caring, support, and
16 rehabilitation (4 items); 2) activities of daily living (6 items); 3) documentation (3 items); 4)
17 monitoring and safety (4 items); and 5) restraints (2 items) (Table 3)) accounted cumulatively
18 for 63% of the total item variance. The five factors were moderate to strong related ($r=.49$ to
19 $r=.71$)⁵.

20 The 5 factor structure shows variations in the initial assignment of the observed items
21 to underlying dimensions of the concept of implicit rationing of nursing care regarding factor
22 1, factor 4, and factor 5 (table 3). These variations in item assignment can be explained by the
23 content of the corresponding items and do not indicate that the internal structure of the

⁴ The interpretation of factor loading is here based on: .45 (20% shared variance) = fair, .55 (30% shared variance) = good, .63 (40% shared variance) = very good, .71 (50% shared variance) = excellent (Comrey & Lee, 1992, as quoted from Pett et.al, 2003 (Pett, Lackey, & Sullivan, 2003)

1 BERNCA is inappropriate. For example the loading of almost all items of the "caring and
2 support" (2a, 2b) and "rehabilitation- instruction-education"(3b-3d) dimensions on factor 1
3 can be explained by the content of these items, which refers, to a certain degree, to assisting
4 patients and / or their families to deal with illness and physical restrictions (table 3).

5 Six items (1c, 1d, 1e, 1f, 3a, and 4c) showed multiple loadings on various factors.
6 These items were assigned to the factors they loaded highest or on which they fit most stably.
7 For example, items 1c and 1d were assigned to factor 2, while item 4c was assigned to factor
8 4. The multiple loading can also be attributed to the content of the items, which refers, in each
9 case, to two or more underlying dimensions (table 3).

10 EVIDENCE BASED ON RELATION WITH OTHER VARIABLES (TABLE 1, H2-3)

11 We explored the evidence based on relations with other variables by examining the
12 relationship between implicit rationing of nursing care and two related concepts: perceived
13 adequacy of nursing resources and patient-to-nurse ratio. The expected negative correlation
14 between implicit rationing of nursing care (measured with the BERNCA) and the perceived
15 adequacy of nursing resources (measured with the NWI-R's nursing resources and autonomy
16 dimension) was confirmed ($r = -.46$). Unexpectedly, only a very weak correlation was found
17 between the BERNCA data and the patient-to-nurse ratio ($r = -.14$).

18 RELIABILITY OF THE BERNCA (TABLE 1, H4, TABLE 5)

19 The reliability of the BERNCA was investigated by calculating the mean, standard
20 deviation, median, interquartile range (IQR), Cronbach's alpha and inter-item correlations.
21 Results are presented in Table 5. The mean (SD) and *median (IQR)* scores for the entire scale
22 were 0.77 (SD 0.52) and 0.70 (IQR 0.79) respectively (possible range: sum 0 – 60; mean /
23 median 0 – 3). Information on differences in these scores among the five subscales can be
24 taken from table 5.

⁵ The interpretation of the correlation coefficient is based on: 00 - .39 = weak, 0.4 – 0.59 = moderate, 0.6 – 0.79

1 As predicted, the BERNCA was internally consistent and homogeneous. No items
2 were eliminated because of redundancy or incongruity with the concept. The item-total
3 correlation (total scale, subscales) ranged from 0.39 to 0.60. The Cronbach's alpha (total
4 scale, subscales) ranged from 0.62 to 0.93 (table 5).

5 **Discussion**

6 The purpose of this study was to evaluate the reliability and validity of the newly
7 developed BERNCA instrument by analyzing survey data from nurses working in five Swiss
8 acute care hospitals. Initial validity and reliability of the BERNCA was established using lines
9 of evidence as suggested in the AERA, APA & NCME guidelines.

10 The EVIDENCE BASED ON TEST CONTENT was confirmed by nursing experts from the
11 German speaking part of Switzerland as well as by pilot testing. It can be expected that in
12 other countries and cultures the responsibilities and scope of nursing care, together with
13 implicit rationing of nursing care, are different than in Switzerland. We strongly recommend a
14 re-evaluation of the evidence based on the test content of the BERNCA instrument before it is
15 used in other countries and cultures.

16 Due to the anonymity of the questionnaire, we cannot fully ensure validity based on
17 the EVIDENCE OF RESPONSE PROCESS as we have no information regarding the strategy and
18 assessment criteria the nurses used when they filled out the BERNCA. However, the
19 evaluated answer pattern indicated that the evidence based on response process was
20 appropriate, and very few missing values were noted. The positively skewed distribution in
21 the answer pattern occurred because the majority of the nurses did not report an inability to
22 carry out the full range of listed necessary nursing tasks in the previous seven days. Due to the

= strong, > 0.8 = very strong (Coolican, 2005)

1 anonymous nature of the questionnaire it is unlikely that response biases such as social
2 desirability or acquiescence are responsible for these skewed distributions.

3 Despite slight challenges in initially assigning the items to the five factors, the one-
4 factor and five-factor solutions both indicate that the internal structure of the BERNCA is
5 appropriate (EVIDENCE BASED ON INTERNAL STRUCTURE) and that nurses tend to limit (or not
6 to limit) their activities within specific dimensions of nursing care in similar ways. This
7 appropriateness is further supported by high internal consistency and inter-item correlations
8 within the subscales. Still, it is possible that the multiple loadings of some items on various
9 factors could be reduced and the internal structure, consistency, and homogeneity of the
10 BERNCA could be further improved, through a revision of the instrument and reformulation
11 of questions with potentially ambiguous meanings (such as question 1f) where the
12 circumstances under which clean sheets would be placed on a dirty bed are not described).

13 An expected association was found between implicit rationing and the perceived
14 adequacy of nursing resources as measured by the NWI-R, but not between BERNCA data
15 and patient-to-nurse ratios. The latter measure was analyzed here in terms of each nurse's
16 personal last-shift workload, rather than as an indicator of workloads across an organizational
17 unit by sampling and aggregating the experiences of nurses in the same units or hospitals, as
18 has been done in other studies (e.g., Aiken, Clarke & Sloane, 2001; Aiken et al., 2002). As
19 such, it may have been too unrefined or limited a measure and not strongly enough linked to
20 the last-seven-working shift time frame for the rationing questions to show a statistical
21 relationship with the BERNCA data. Future research will be necessary to evaluate how the
22 BERNCA relates to other measures of nursing workload beyond patient-to-nurse ratios, such
23 as: the amount and type of nursing resources needed to care for an individual patient, the
24 patient case mix and complexity; the acuity of the patient situation; the adequacy of staffing
25 and resources to give high-quality patient care (O'Brien-Pallas, Meyer, D., & T., 2005).

1 **Conclusion**

2 Initial validity and reliability of the BERNCA as a research tool for assessing implicit
3 rationing of nursing care in acute care hospitals were documented in a sample of hospitals and
4 nurses in the Swiss-German speaking part of Switzerland. The BERNCA is a short instrument
5 which can be filled out easily and quickly and appears to be well-suited to research on impacts
6 of cost-cutting, shortages of qualified staff or both, on the quality of care in hospital settings.
7 Future studies will be necessary to evaluate the extent to which the instrument measures and
8 predicts changes in the quality of care and patient outcomes. In order to enhance the reliability
9 and validity of the BERNCA for use in other countries and areas, revisions of the instrument
10 are recommended to reflect cultural and regional differences.

11

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Table 1: Lines of validity and reliability testing (Standards for educational and psychological testing (p 9– 35) (AERA et al., 1999)

Validity	
Evidence based on content	<p>Q1: Does the BERNCA measure the content domain of implicit rationing of nursing care based on the chosen conceptualization and operationalization?</p> <p>Q2: Are the items of the BERNCA relevant, important, and well-defined?</p>
Evidence based on response process	<p>Q3: Is there a systematic pattern of missing values for different items of the BERNCA?</p> <p>Q4: Is there evidence for any specific answer pattern e.g. positive or negative skewed distributions?</p>
Evidence based on internal structure	<p>H1: An explanatory factor analysis confirms the interrelationship of the different observed items congruently with the theoretical framework:</p> <ul style="list-style-type: none"> - a) A moderate to strong correlation between each observed item (n= 20) and the overall factor implicit rationing of nursing care. - b) A moderate to strong correlation between the observed items which represent a specific underlying dimension of implicit rationing of nursing care.
Evidence based on relations to other variables	<p>H2: There is a negative correlation between implicit rationing of nursing care measured with the BERNCA and the perceived adequacy of nursing resources as measured with the NWI-R nursing resources and autonomy dimension.</p> <p>H3: There is a moderate positive correlation between the BERNCA and the patient-to-nurse ratio = number of patients assigned to a nurse in the last shift.</p>
Reliability & measurement errors	<p>H4: The BERNCA instrument is internally consistent and homogenous.</p>

Table 2: Characteristics of nurse sample

Nurses (total –n)	957
Female (%)	91
Non Swiss Nationality (%)	22
Age (%)	
20-30 years	43
31-40	29
41-50	20
> 50	8
Education (%)	
Specialized*	31
Graduate and postgraduate§	1
Years working mean (SD ⁺), median (IQR ^{&})	
as a nurse	10.32 (9.19), 7.17 (13.06)
in hospital	7.53 (7.64), 4.08 (10.40)
at unit	5.66 (6.43), 3.00 (6.25)

* Specialized education e.g. Intensive care, higher education in nursing (level 1), clinical teacher

§ Graduate and postgraduate education e.g. advanced education in nursing (level 2), advanced education, or university degree in nursing management, pedagogic, science, and public health

& IQR = Interquartile range

+ SD = Standard Deviation

Table 3: Results 5-factor solution (Method Principal Component Analysis with Varimax rotation)

Extracted Factors = Subscales						Mean	SD
1 Caring & Support & Rehabilitation							
2a) Offer emotional or psychosocial support to patients	.630	.238	.335	.246	.029	1.30	0.83
2b) Have a necessary conversation with patient or family	.675	.237	.322	.194	.095	0.90	0.83
3b) Perform activating or rehabilitating care	.678	.242	.194	.201	.246	0.92	0.82
3c) Teach and /or educate a patient and / or their family about their necessary self-care	.701	.191	.146	.156	.258	0.55	0.71
3d) Prepare a patient / family for hospital discharge	.695	.176	.227	.270	.138	0.80	0.76
2. Activities of Daily Living = ADL							
1a) Assist a patient with a necessary sponge bath or skin care	.221	.771	.171	.154	-.071	0.58	0.71
1b) Perform a necessary oral or dental hygiene to a patient	.290	.714	.130	.236	.037	0.62	0.76
1c) Feed the patient a needed	.049	.601	.267	-.002	<u>.443</u>	0.33	0.63
1d) Mobilize or change the position of a patient	<u>.382</u>	.476	.129	.234	<u>.303</u>	0.66	0.76
1e) Leave a patient for longer than half an hour in urine, stool, or vomit	.220	.510	.053	.128	<u>.386</u>	0.20	0.48
1f) Put clean sheets on a dirty bed	<u>.338</u>	.381	.211	<u>.330</u>	.212	0.71	0.76
3. Documentation							
5a) Go over the patient documentation at the beginning of your shift	.186	.152	.742	.199	.141	0.87	0.85
5b) Set up or bring a patient's care plan up to date	.322	.171	.728	.193	.174	1.14	0.86
5c) Document nursing care delivered	.281	.199	.762	.186	.173	0.86	0.79
4. Monitoring & Safety							
4a) Monitor a patient as closely as had been prescribed by a physicians or as you felt was necessary	.199	.221	.197	.640	.170	0.70	0.81
4c) A Physician either did not come in person or took a long time to arrive after you called him / her in relation to sudden changes in the health status of a patient	.193	-.051	.262	.478	<u>.526</u>	0.96	0.92
4d) Keep a patient who had rung for a nurse waiting longer than 5 minutes	.152	.144	.095	.695	.252	0.84	0.86
4e) Not wash or disinfect your hands adequately	.264	.180	.219	.686	-.095	0.70	0.77
5. Restraints							
3a) Put a patient in diapers or insert a catheter because you did not have time for toilet training	<u>.545</u>	.177	.078	.034	.578	0.57	0.82
4b) Restrain and / or give confused patients sedatives because you were not able to watch them carefully enough	.196	.144	.217	.184	.701	0.76	0.70

Table 4: Correlations between the implicit rationing of nursing care (BERNCA) concept and the related concepts perceived adequacy of nursing resources, patient-to-nurse ratio

	Implicit rationing of nursing care BERNCA Total scale
Perceived adequacy of nursing resources (NWI-R subscale: nursing resources and autonomy)	-,46(**)
Patient-to-nurse ratio	,14(**)

** Spearman's rho, correlation is significant at the 0.01 level (2-tailed)

Table 5: Reliability indices of the Rationing Effects of Nursing (BERNCA) instrument

EORONC	Mean ^o	SD	Median	IQR	Inter-item correlation			Cronbach's alpha
					mean	min	max	
Entire scale (n=20)	0.77	0.52	0.70	0.79	0.39	0.19	0.68	0.93
Subscales								
1 Caring & Support & Rehabilitation (n=5)	0.90	0.63	0.80	1.00	0.56	0.45	0.68	0.86
2 ADL (n=6)	0.51	0.49	0.33	0.67	0.41	0.30	0.60	0.80
3 Documentation (n=3)	0.96	0.71	1.00	1.00	0.60	0.55	0.69	0.82
4 Monitoring & Safety (n=4)	0.78	0.61	0.75	1.00	0.39	0.33	0.41	0.71
5 Restraints (n=2)	0.67	0.73	0.50	1.00	0.45	0.45	0.45	0.62

^o Range: 0.00 to 3.00