


BMJ Open Measuring patients' experience of nursing quality in acute hospitals: review of existing scales and development and psychometric validation of a new scale

Kai Svane Blume,¹ Uta Kirchner-Heklau,² Vera Winter ,¹ Gabriele Meyer,² Steffen Fleischer²

To cite: Blume KS, Kirchner-Heklau U, Winter V, *et al*. Measuring patients' experience of nursing quality in acute hospitals: review of existing scales and development and psychometric validation of a new scale. *BMJ Open* 2024;**14**:e072838. doi:10.1136/bmjopen-2023-072838

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2023-072838>).

Received 16 February 2023
Accepted 06 December 2023



© Author(s) (or their employer(s)) 2024. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

¹Schumpeter School of Business and Economics, University of Wuppertal, Wuppertal, Germany
²Institute for Health and Nursing Science, Medical Faculty, Martin Luther University Halle-Wittenberg, Halle (Saale), Germany

Correspondence to

Dr Vera Winter;
winter@wiwi.uni-wuppertal.de

ABSTRACT

Objective To provide an overview of existing instruments measuring patient-perceived quality of nursing care and to develop and psychometrically evaluate a new multidimensional scale applicable to the German acute care sector.

Design We conducted a scale development and validation study involving the following phases: (1) performing a structured literature search to identify existing scales, (2) generating an initial pool of items using the results of the literature search and expert interviews, (3) coding/categorising the item pool, (4) organising a peer researcher workshop to select relevant items, (5) drafting the survey questionnaire and conducting cognitive pretesting, (6) pilot testing the survey questionnaire, (7) administering the survey to a large sample of hospital patients and (8) conducting a psychometric evaluation comprising exploratory factor analysis using the survey results, followed by confirmatory factor analysis and reliability and validity assessment of the resulting draft scale.

Survey participants 17 859 recently hospitalised patients discharged from non-intensive care in non-paediatric and non-psychiatric hospital units in Germany between May and October 2019.

Results We identified 32 instruments comprising 635 items on nursing care quality. Alongside 135 indicators derived from expert interviews, these formed our initial item pool, which we coded into 15 categories. From this pool, 36 items were selected in the peer researcher workshop for pretesting and psychometric evaluation. Based on the results of our exploratory and confirmatory factor analyses, we propose a second-order scale to measure Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH), including the two higher-order dimensions 'patients' perception of direct nursing care activities' and 'patients' perception of guidance provided by nurses'. The results of various tests suggest the scale has sufficient goodness of fit, reliability and validity.

Conclusions The PENQuAH scale is promising in terms of its psychometric properties, the plausibility and meaningfulness of its dimensions, and its ease of use.

INTRODUCTION

Nurses play a critical role in patient safety and quality of care, performing essential tasks such as triage, early identification of

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) scale was developed based on a review of existing instruments and the results of expert interviews and a peer researcher workshop, allowing us to identify a broad set of indicators of nursing care quality.
- ⇒ The psychometric evaluation of PENQuAH was extensive and based on a large sample of hospital patients in Germany.
- ⇒ Due to the cross-sectional nature of our dataset, we were not able to test PENQuAH's test-retest reliability or predictive validity.
- ⇒ We encourage researchers to validate the PENQuAH scale using additional longitudinal samples and to translate it into other languages to allow it to be validated in other patient populations.

life-threatening conditions, administering medications and monitoring patients for clinical worsening.^{1 2} This entails great responsibility and explains why monitoring the quality of nursing care is important. There is a growing interest in the association between nursing care quality and lapses in healthcare systems, such as staff shortages, as well as in the extent to which decreases in the quality of nursing care negatively affect patient health outcomes. To date, however, the quality of nursing care has usually been operationalised using very general measures that employ, for example, one or two global items^{3–5} or by using multidimensional constructs that include only a small subset of indicators specific to nursing care.^{6–8} Moreover, some studies consider the quality of nursing care only indirectly by exploring related constructs, such as missed, unfinished and rationed nursing care.^{9 10} These restrictions limit our ability to understand the associations and interactions

between structural variables such as staffing and skill mix, the quality of nursing care and patient outcomes. To fill this research gap, it is vital to ensure that the quality of nurse-delivered care can be measured systematically and precisely.

While there is no universally accepted definition of the quality of nursing care, there is general agreement that it is a complex construct reflecting patients' overall experience with the various facets of their interaction with, and the treatment by, nurses during a hospital stay. Furthermore, quality of care is frequently considered a multidimensional construct with a technical and an interpersonal component.^{11–13}

Although a number of instruments have been developed to measure the quality of nursing care, there is no overview of them, their different content dimensions, their areas of focus or the strategies that have been used to validate them. Additionally, they are highly heterogeneous in their comprehensiveness and focus, and few appear to have undergone adequate psychometric evaluation. Our aims were, therefore, to address these gaps by (1) reviewing existing scales for measuring patients' perception of nursing care quality based on a structured search of the literature; (2) using the results of the search and an expert workshop to develop a pool of items suitable for a scale to measure Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH); (3) drafting, piloting and conducting a psychometric evaluation of such a scale in a large sample of patients and (4) presenting the resulting scale as a measure to be expanded on in future research. The development of the scale involved several steps, which are depicted in [figure 1](#).

STRUCTURED LITERATURE REVIEW

We conducted a structured search of the literature on existing scales that measure the quality of nursing care. To do so, we used the electronic database CINAHL because it covers the most relevant nursing journals. We conducted the search in May 2018 using the search strategy and inclusion and exclusion criteria described in online supplemental file 1, source 1.

After duplicates were removed, the search yielded 170 titles and abstracts, which were subsequently screened by one researcher (UK-H). Excluding records based on our inclusion and exclusion criteria (n=126) left 44 publications, which were screened in full text by the same researcher. Of these, 10 publications were excluded because they did not meet our inclusion criteria, and 2 because they were not available in full text. This yielded a total of 32 publications. Of these, 24 described the development and/or evaluation of a new scale and 8 described the development and/or evaluation of a refined, shortened or translated version of one of these 24 scales. One of the publications provided two different versions—that is, one shorter and one longer, of a scale.¹⁴ Overall, we, therefore, identified 32 publications presenting a total of 33 different scales.

To ensure that our overview of existing scales was current, we conducted an additional search of the literature in July 2023 using the same search strategy. This identified five further publications, which are summarised in online supplemental table 1. These were not included in the PENQuAH scale construction process.

[Figure 2](#) visualises the process of publication selection.

One researcher (KSB) developed a data extraction sheet in Microsoft Excel to gather information on the 38 scales and their characteristics (see online supplemental table 1). Of these, 22 were in English, 1 was in multiple languages,¹⁵ 2 were in Chinese and the remaining 13 were each in 1 of a variety of mainly European languages. We found that these scales were highly heterogeneous in their comprehensiveness and focus. Whereas some scales were very extensive, comprising more than 40 or even 60 items, and measured the quality of nursing care as a multidimensional construct (eg, [16–18](#)), others were very short and captured only a general or unidimensional picture of nursing care (eg, [19–21](#)) or focused on the quality of overall hospital care and included only a small subset of items specific to nursing care (eg, [22, 23](#)). The 38 scales consisted of an average of 29 items (range: 3–71). Seven scales assessed only a very specific aspect of nursing care quality, such as individuality of care²⁴ or the quality of posthospital care preparation.²⁵ Moreover, the scales varied in terms of the extent and type of psychometric evaluation to which they had been subjected. Only seven scales had been empirically tested using both exploratory and confirmatory factor analysis (CFA) (eg, [26, 27](#)).

SCALE DEVELOPMENT

Generating the initial pool of items for the survey questionnaire

Of the 32 publications (excluding the 5 publications identified through our additional search in July 2023 because these were identified after the scale construction process) identified in our literature search, 25 provided the full item set in English or German for the scale being reported and were thus suitable as a basis for our scale construction process. For one scale, we identified a German and an English version, so we used only the former. Hence, in total, we used items from 24 existing scales to construct our new scale (PENQuAH).

Using MAXQDA V.18, we compiled a list comprising each item (n=759) from each identified scale. In total, 635 of these items were related to nursing care and 124 were related to other aspects of hospital quality, such as the quality of physician care or hospital cleanliness. This served as our basic pool of items, which we subsequently expanded by interviewing health professionals with clinical experience in different medical settings. Details of the methods used in these expert interviews are described elsewhere.²⁸ From the interview transcripts, we extracted all quality attributes mentioned by the experts (n=135).

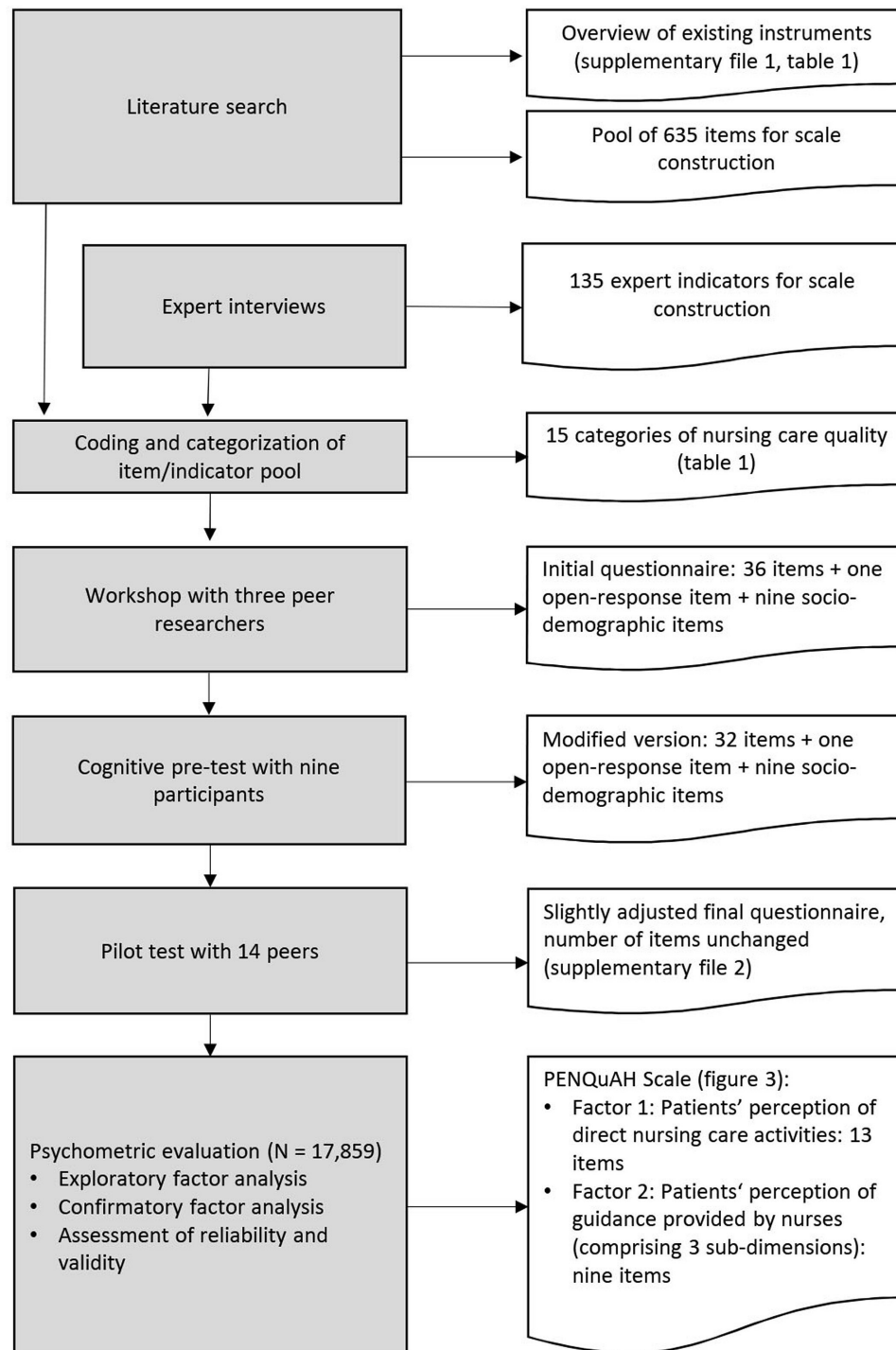


Figure 1 Flow chart for scale development. PENQuAH, Patients' Experience of Nursing Quality in Acute Hospitals.

Data analysis and processing

Following the coding process proposed by Saldaña,²⁹ the complete data set was coded descriptively in one cycle by one researcher (UK-H) resulting in 894 codes. The 124 codes pertaining to the measurement of related constructs were not further included in the scale construction process. The researcher grouped the remaining 770 codes into 15 categories of nursing care quality. Online supplemental figure 1 illustrates the coding and categorisation process for an exemplary category. [Table 1](#)

provides an overview of all 15 categories of nursing care quality and their sources.

Item evaluation and selection for the survey questionnaire

To ensure that the items we selected for the survey questionnaire were relevant to the setting, we conducted a workshop with three peer researchers who had clinical experience as a nurse or occupational therapist. After reviewing all categorised items and indicators, the participants chose for each category at least two indicators that

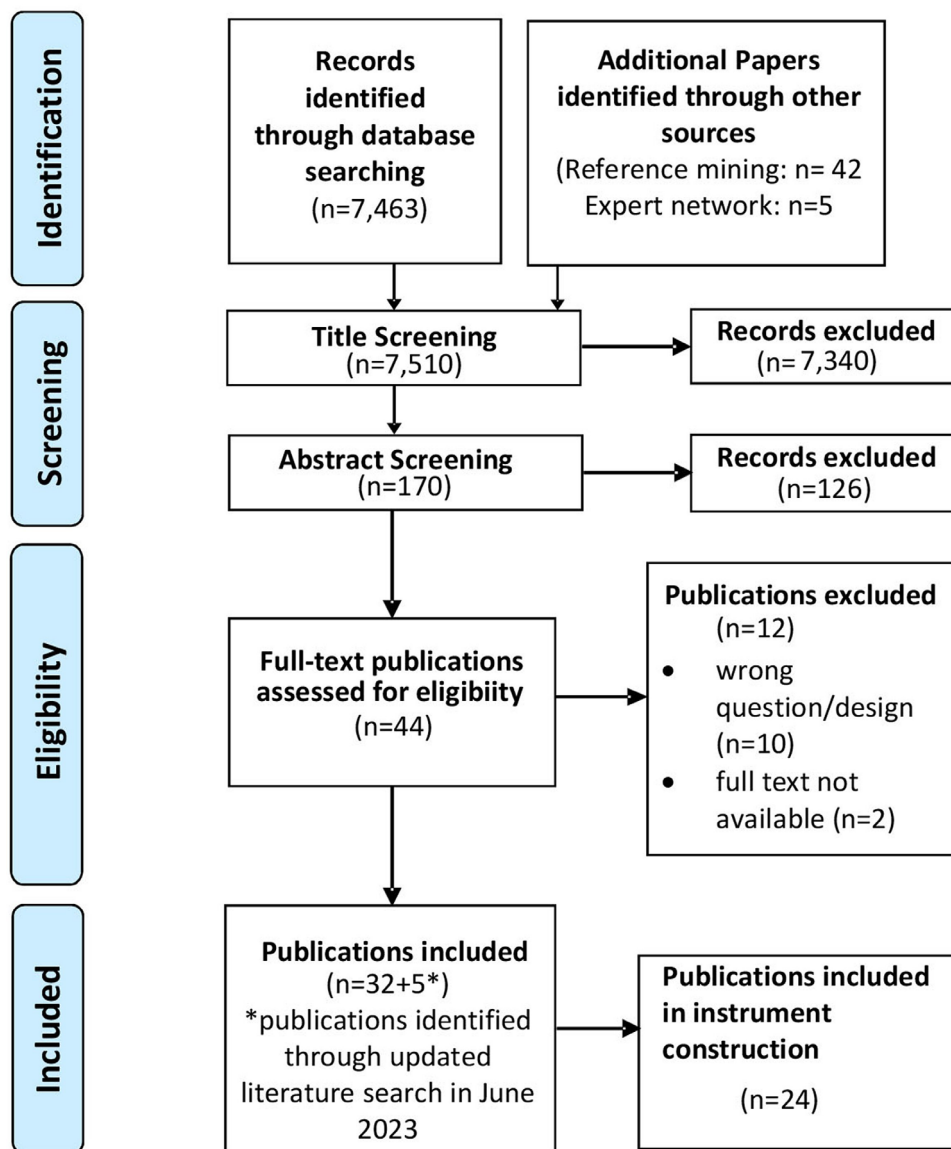


Figure 2 PRISMA flow chart, in accordance with the PRISMA 2020 statement which provides reporting guidance for systematic reviews.⁷¹ PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

they deemed relevant to the target population. At this point, it became clear that one scale from our structured search of the literature³⁰ included a considerable share (n=13) of the items on the list generated by our workshop (n=36). Because this scale had already undergone cognitive pretesting and been piloted at seven sites and revised accordingly, we decided to translate it in its entirety into German according to the criteria defined by the International Society for Pharmacoeconomics and Outcomes Research (ISPOR).³¹ We then expanded it by adding 23 items that the translated scale did not cover. The items were constructed in an iterative consensus process based on the pool of items resulting from our literature search and the indicators from the expert interviews. The resulting draft of the survey questionnaire contained 36 Likert-scale items on nursing care quality, 9 sociodemographic items and 1 open-ended question.

We subsequently subjected the draft survey questionnaire to cognitive pretesting,³² presenting it as a pen-and-paper tool in cognitive interviews conducted by one researcher (UK-H) with nine purposefully selected participants (see online supplemental table 2). Based on the results of the pretest, we modified a number of items (see online supplemental table 3). Lastly, an online version of the resulting survey questionnaire was piloted among 14 peer researchers, resulting in further minor adjustments in language and formatting.

Final version of the survey questionnaire

The final version of the survey questionnaire contained 32 Likert-scale items on the quality of nursing care, 1 open question and 9 questions on sociodemographics (the translated English and the original German items can be found in online supplemental file 2). Of the 32

Table 1 Categories of nursing care quality derived from existing scales and expert interviews

Category	No of codes derived from:		No of sources per category*
	Previous scales	Expert interviews	
Quality of nursing care	635	135	–
Access to nursing care	70	0	16
Time in the context of providing nursing care	29	0	15
Individualised care	96	1	22
Nursing care related to the treatment of a disease or condition	20	7	12
Communication and information	89	19	23
Nursing care related to basic personal needs and hygiene	58	30	17
Discharge management	18	9	9
Emotional support	43	1	15
Involving significant others in care	18	2	11
Friendly, respectful atmosphere	39	0	14
Trust in nurses	48	0	19
Overall evaluation of care	21	0	10
Counselling and guidance of the patients	48	27	17
Use of formal and informal postdischarge assistance	0	1	1
Nursing-sensitive outcome indicators from the patient's perspective (complaints) after discharge	37	38	3

*Sources per category=number of scales containing items in this category plus one if category was also identified through expert interviews.

items, 17 used a 5-point Likert scale, 5 used a 5-point Likert scale plus a 'not applicable to me' option, 4 used a 4-point Likert scale and 6 used a 3-point Likert scale. Seven of these items were reverse-coded. At this point in the scale development process, we still considered all items to be potential items to include in the PENQuAH scale pending psychometric evaluation.

We also collected sociodemographic information of potential relevance. Specifically, we asked the survey participants to indicate the following: (1) the person who filled out the questionnaire (patient, relative, etc), (2) any difficulties the patient experienced, for example, in activities of daily living or communication, prior to the hospital stay, if applicable, (3) nationality(ies), (4) relationship status, (5) highest educational level, (6) degrees or vocational qualifications, (7) employment situation, (8) number of people in the household and (9) average monthly net household income. In subsequent data analyses,³³ we also considered additional factors, namely patient age, gender and any comorbidities or complications.

Sample

As part of a project on the link between nurse staffing and patient outcomes,^{28 33–35} the survey questionnaire was distributed to recently hospitalised individuals insured by the largest statutory health insurer in Germany. We included only adult non-intensive care patients who had been discharged between May and October 2019 after a stay of at least two nights in non-paediatric and non-psychiatric hospital units. We did not contact people who

had been classified as having the two highest levels of long-term care needs according to the 5-point German scale for grading these needs,³⁶ nor those who required a legal representative, were receiving hospice care, or had been approached recently by the health insurer with another survey. We randomly selected about 25 000 patients per wave from the pool of eligible people (ie, those who fulfilled our inclusion criteria) and contacted them in 5 monthly waves no later than 8 weeks after their hospital stay. The random selection was carried out by a member of the insurer's IT services not involved in the project (using SAS: proc survey select). All patients were contacted only once with an invitation letter informing them about the background and goals of the survey, including information about the measures that would be taken to ensure their anonymity. For the analyses described here, we used a subsample of 17 859 patients who completed the survey. The full sample is described elsewhere and, as can be seen in online supplemental table 4, was generally representative in terms of patients' age, gender and the state in Germany in which their hospital treatment took place.^{34 35} Additionally, the table gives a comprehensive overview of other patient characteristics, such as highest educational level, net household income categories and difficulties with activities of daily living before and since the hospital stay.

Patient and public involvement

We involved patients in this study by asking them to respond to the final survey questionnaire and evaluating their responses. We obtained written informed consent

from all participants before they took part in the survey. Patients and the public were not involved in the design, setting or conduct of the study.

Psychometric evaluation of the PENQuAH scale

Analytical strategy and challenges

To examine the latent dimensionality and underlying factor structure of the final survey questionnaire, we performed exploratory factor analysis (EFA). Next, we used CFA to verify the factor model derived from EFA, as well as to allow well-founded decisions on model modifications and to assess overall model fit. We randomly split the sample into three subsamples. Because the exploratory nature of EFA requires a larger number of parameters, we used 50% of the full sample ($n=8929$) for EFA, 25% to replicate the resulting factor model using CFA, and the last 25% for CFA after potential model modifications and to calculate reliability and validity measures ($n=4465$, respectively).

Exploratory factor analysis

We used Stata SE V.15 for EFA, which we estimated using principal axis factoring because this extraction method makes no distributional assumptions³⁷ and provides the best results with non-normal data.³⁸ To improve the interpretability of our results,³⁹ we performed oblique promax rotation because we assumed the factors to be correlated. We excluded items if they had no meaningful loading on any factor (<0.32) or if they showed substantial cross-loading (difference to main loading <0.15 or absolute cross-loading >0.32), as suggested by Worthington and Whittaker.⁴⁰ We excluded only one item per estimation round and ran EFA again after each exclusion.⁴¹

For deciding on the number of factors to extract, parallel analysis (PA) is widely recommended. Auerswald and Moshagen suggest using (1) 95th percentiles instead of average eigenvalues as reference values and (2) eigenvalues from principal component analyses (PCA) instead of EFA reference eigenvalues (PA_{PCA-95}).⁴² We followed this suggestion and additionally performed sensitivity analyses using the alternative PA_{EFA-M} approach (ie, using average EFA eigenvalues as reference values).

Seven of our items contained a 'not applicable' option to account for the fact that some aspects of nursing care might not be experienced by all patients. We coded the respective values as missing. To handle missing data while performing EFA, we applied an iterative procedure based on the expectation-maximisation (EM) algorithm, which has been found to yield good parameter estimates.^{43 44} We set the nominal sample size to the column-wise average number of observed cases for each variable. In contrast to using complete data sample sizes, this accounts for uncertainty in estimations due to missingness.⁴³

The EM algorithm assumes the missing data to be missing at random (MAR). To fulfil the MAR assumption, we included an auxiliary variable in the estimation model that was not part of the main model but correlated with missingness. Doing so can reduce estimation bias and

partially compensate for power loss due to missingness.⁴⁵ In our case, the seven variables indicating that a service was not necessary/not relevant during the patient's hospital stay not only explained but were direct indicators of missingness. Because including direct missingness indicators would have led to identification problems with the imputation model,⁴⁶ we instead created a condensed missingness variable indicating the number of nursing services that were not relevant during the hospital stay (ie, the sum of missing values for each observation). The correlations of the newly created variable with each of the seven missingness indicators were statistically significant (Spearman's correlation $r=0.4-0.81$; $p<0.001$, respectively). Thus, the variable was considered a useful auxiliary variable.

Confirmatory factor analysis

Because some of the approaches described in the following are not available in Stata, we performed the entire CFA using MPLUS V.8.3. We used the limited information diagonally weighted least squares mean and variance adjusted estimator, which has been proposed for estimating ordinal factor analysis models.⁴⁷ With respect to goodness-of-fit indices, we report the standardised root mean square residual (SRMR), the root mean square error of approximation (RMSEA), the Comparative Fit Index (CFI) and the Tucker-Lewis index (TLI).⁴⁸ We concluded that the overall fit was adequate when the SRMR was close to 0.08 or below, the RMSEA was close to 0.06 or below, and the CFI and TLI were close to 0.95 or greater.⁴⁹ However, because the χ^2 test statistic tends to be upwardly biased after multiple imputation,⁵⁰ we attributed greater weight when evaluating the models to CFI and TLI than to the potentially biased SRMR and RMSEA.

In contrast to EFA, CFA allows multiple imputation to be applied directly. To impute the missing ordinal data, we performed the latent variable approach that was the most convincing based on simulation studies^{46 51} and set the number of imputations to 90, which satisfies different rules of thumb in terms of minimising loss of power and maximising the precision of inference statistics.⁵²⁻⁵⁴ We included the same auxiliary variables in the imputation model as in the EFA framework.

Reliability and validity assessment

We assessed reliability by calculating the greatest lower bound (GLB) separately for the two factors of the proposed model. The GLB is an alternative to the widely used Cronbach's alpha, which is known to be severely biased under realistic survey conditions.^{55 56} Nevertheless, to allow comparability with existing scales, we report both GLB and Cronbach's alpha. All calculations were performed using the 'userfriendlyscience' package⁵⁷ for R V.R.4.2.0⁵⁸ along with the tutorial provided by Peters.⁵⁹ Because the package does not allow analyses based on multiple imputed datasets, we calculated the GLB and

Cronbach's alpha for 10 imputed datasets separately and manually averaged the results.

We assessed content validity by analysing the open-response format item asking whether there was anything else that had not been included in the questionnaire which the patient considered important regarding nursing quality. The underlying hypothesis was that, if content validity is high, respondents should not be able to identify new relevant indicators of nursing care quality. We conducted a content analysis of a random subsample ($n=2000$) of all open responses to determine whether new categories of nursing care quality arose. Details of this analysis have been published elsewhere.⁶⁰

We analysed construct validity by testing whether the scores calculated from the identified factors and subdimensions of patient-perceived nursing care quality were associated with related constructs and measures. For this purpose, we used items that had been removed from the scale early in the process of psychometric validation, examining correlations between PENQuAH scores and patients' nursing-related loyalty towards the hospital, patient falls and quality of life after discharge. We hypothesised that if patients rated the quality of nursing care as high, they would have more loyalty towards the hospital. Furthermore, we hypothesised that higher quality of nursing care is negatively associated with patient falls and positively related with recovery, ie, with a lower need for help with various activities of daily living after a hospital stay. In line with other researchers who point out that outcomes differ with regard to their nursing sensitivity,^{33,61} we expected the correlations to be highest for nursing-related loyalty, because the other two constructs are less direct and are dependent on a multitude of causations. We tested these hypotheses by calculating Spearman's correlation coefficients. Before averaging across items to generate scores for the PENQuAH factors, we standardised the items to account for their different scales. Because Spearman's correlation coefficients are not available for multiply imputed data in Stata, we calculated them for 10 imputed datasets separately and manually averaged the results.

Lastly, we applied the CICFA(sys) method proposed by Rönkkö and Cho⁶² to assess the discriminant validity of the factors in our proposed model. This method is based on the standardised factor solutions obtained from CFA and compares the upper limits of the 95% CIs of the estimated factor correlations against cut-offs for four categories of discriminant validity problems.

RESULTS OF THE PSYCHOMETRIC EVALUATION

Adequacy of the data for factor analysis

We used two criteria to test whether the 32 items in the final survey questionnaire (see section 'Final version of the survey Questionnaire' and online supplemental file 2) were adequate for factor analysis. First, we analysed the Spearman correlation matrix of the items. Pairwise correlations were generally of moderate to large magnitude and

statistically significant. With the exception of items 24–29, most of the intercorrelations exceeded 0.31 and were thus considered adequate.⁶³ The low pairwise correlations between items 24 and 29 and the remaining items were plausible because the former do not directly reflect the quality of, or satisfaction with, nursing care. We therefore excluded these items from subsequent analyses and the draft scale. Second, we calculated the Kaiser-Meyer-Olkin measure of sampling adequacy, which for the full set of items was 0.98, and therefore, also supported sample adequacy.⁶⁴

Results of the EFA

Parallel analysis

Online supplemental figure 2 shows the results of the two specifications of PA, PA_{PCA-95} and PA_{EFA-M} , that we used to guide our decision on the number of factors to extract. The results of PA_{PCA-95} suggested that two factors should be extracted, which is in line with what Cartell's scree test would imply (ie, 2–3 factors) and seemed plausible considering the shape of the curves. The results of PA_{EFA-M} suggested that eight factors should be extracted because the EFA eigenvalues exceeded those from the PA for the first eight factors. However, the two curves converged before their point of intersection. Only for 3–5 factors was the EFA curve clearly steeper than the reference curve. This and the fact that eight factors would have meant an average of only 3.25 items loading on each factor suggest that PA_{EFA-M} overextracts factors. Auerswald and Moshagen point out that PA specifications might perform poorly due to model characteristics such as highly correlated factors. Even though the results of PA_{PCA-95} seem to be more plausible, it is unclear whether such problems apply only for PA_{EFA-M} . Hence, considering the lack of robustness of the results of both decision methods, we tested all solutions between the two factor and eight factor solutions and compared them in terms of their plausibility.

Factor extraction

Table 2 depicts the factor solutions from all estimated factor extractions. The extraction of eight factors resulted in many cross-loadings and weak factor loadings. Excluding 11 items due to weak factor loadings or cross-loadings yielded 15 items loading on 6 factors (we updated the PA_{EFA-M} after excluding each item). Ultimately, only seven factors were suggested, although with none of the items loading on factor 7.). Three factors were represented by only two items each. This was problematic because a minimum of three items per factor is recommended to prevent underidentification and allow for a stable factor solution.⁴⁸ Furthermore, several of the items had low communalities (seven items' communality was <0.4), which might indicate that they were of low reliability. Hence, extracting eight factors seemed unsuitable given our data structure. Extracting six and seven factors resulted in similar problems, and extracting five factors led to even more items being excluded.

Table 2 EFA results after extracting 2–8 factors

Item	Item content*	EFA after oblique promax rotation; extraction of...						
		2 factors	3 factors	4 factors	5 factors	6 factors	7 factors	8 factors
1	Providing the required care	F1 (0.73)	F1 (0.45)	F1 (0.45)	No solution after 15 EFA rounds	F4 (0.45)		
2	Quick reaction to the patient's call bell	F1 (0.66)	F1 (0.53)	F1 (0.53)		F4 (0.44)		
3	Responding to personal needs	F1 (0.77)	F1 (0.67)	F1 (0.69)		F4 (0.43)		
4	Pain treatment	F1 (0.59)	F1 (0.47)	F1 (0.48)		F4 (0.44)	F4 (0.38)	F4 (0.39)
5	Guidance on pain management					F4 (0.37)	F4 (0.38)	F4 (0.40)
6	Care of physical well-being	F1 (0.74)	F1 (0.65)	F1 (0.66)		F4 (0.53)		
7	Providing understandable information	F1 (0.56)	F1 (0.51)	F1 (0.49)			F6 (0.40)	
8	Sympathetic treatment	F1 (0.79)	F1 (0.77)	F1 (0.78)		F6 (0.57)	F5 (0.51)	F6 (0.52)
9	Polite and respectful treatment	F1 (0.73)	F1 (0.71)	F1 (0.71)		F6 (0.57)	F5 (0.52)	F6 (0.53)
10	Information: procedures and next steps in treatment	F1 (0.51)	F1 (0.45)	F1 (0.43)			F6 (0.38)	
11	Talking about fears and worries	F1 (0.55)	F1 (0.52)	F1 (0.50)				
12	Taking sufficient time for care	F1 (0.62)	F1 (0.57)	F1 (0.55)		F4 (0.38)		
13	Team work in order to provide best possible care	F1 (0.66)	F1 (0.54)	F1 (0.52)				
14	Relatives taking on nursing tasks due to missed care	F1 (-0.43)	F1 (-0.36)	F1 (-0.36)				
15	Guidance on eating/drinking and personal care/hygiene	F2 (0.66)	F2 (0.63)	F4 (0.48)		F2 (0.56)	F1 (0.42)	F2 (0.46)
16	Guidance on physical movements	F2 (0.75)	F2 (0.72)	F4 (0.76)		F2 (0.84)	F1 (0.75)	F2 (0.82)
17	Guidance on physical strain	F2 (0.78)	F2 (0.75)	F4 (0.66)		F2 (0.71)	F1 (0.68)	F2 (0.74)

Continued

Table 2 Continued

		EFA after oblique promax rotation; extraction of...						
Item	Item content*	2 factors	3 factors	4 factors	5 factors	6 factors	7 factors	8 factors
18	Guidance on medication	F2 (0.54)	F2 (0.52)	F2 (0.60)		F1 (0.46)		F1 (0.32)
19	Guidance on home-use medical supplies and devices: need and access	F2 (0.75)	F2 (0.74)	F2 (0.81)		F1 (0.79)	F2 (0.67)	F1 (0.78)
20	Guidance on home-use medical supplies and devices: handling	F2 (0.78)	F2 (0.77)	F2 (0.76)		F1 (0.78)	F2 (0.65)	F1 (0.77)
21	Support with hospital discharge	F2 (0.49)	F2 (0.48)	F2 (0.50)		F3 (0.51)		F3 (0.53)
22	Support: Taking care of own health	F2 (0.66)	F2 (0.66)	F2 (0.63)		F3 (0.45)		F3 (0.47)
23	Guidance: When to see a doctor after hospital discharge	F2 (0.56)	F2 (0.54)	F2 (0.52)		F3 (0.42)		F3 (0.44)
24–28	More assistance after hospital stay: providing meals; shopping; household; financial matters; personal hygiene							
29	Falling/slipping during hospital stay							
30	Trust in nursing staff after hospital stay	F1 (0.59)						
31	Likelihood of recommending the hospital considering experience of nursing care	F1 (0.77)	F3 (0.79)	F3 (0.79)		F5 (0.77)	F3 (0.73)	F5 (0.74)
32	Likelihood of choosing same hospital again considering experience of nursing care	F1 (0.72)	F3 (0.81)	F3 (0.82)		F5 (0.77)	F3 (0.74)	F5 (0.74)
Proportion of explained variance per factor		F1: 0.72 F2: 0.56	F1: 0.61 F2: 0.54 F3: 0.39	F1: 0.61 F2: 0.54 F3: 0.40 F4: 0.35		F1: 0.50 F2: 0.47 F3: 0.41 F4: 0.36 F5: 0.27 F6: 0.19	F1: 0.49 F2: 0.40 F3: 0.36 F4: 0.25 F5: 0.21 F6: 0.19	F1: 0.61 F2: 0.58 F3: 0.53 F4: 0.33 F5: 0.24 F6: 0.13

This table depicts the factor solutions from all estimated factor extractions after EFA with oblique promax rotation, factor loadings are given in parentheses. Bold designations F1 to F6 indicate the factors extracted from each EFA specification. Each factor has been assigned a random colour (ie, without any particular meaning) in order to make it easier to see the overall distribution of factors at a glance. Dark grey boxes indicate that items had to be excluded due to weak factor loadings or cross-loadings. Items 24–29 were excluded prior to factor analysis due to low pairwise correlations with the remaining items. For the sake of completeness, they are shown in a shortened version in light grey. When trying to extract 5 factors, no factor solution could be achieved after 15 EFA rounds (ie, further item exclusions would have been necessary). We stopped after round 15, which is why no factor loadings are provided for this. Full factor loading matrices are available upon request.
 *Shortened item text. See online supplemental file 2 (translated English and original German questionnaire) for full item texts.
 EFA, exploratory factor analysis.

Extracting 2–4 factors, as suggested by PA_{PCA-95} and supporting the presumption of a smaller number of underlying factors, led to much better results and a robust factor structure across the solutions. Apart from factor 3 of the three-factor and four-factor models, each factor was represented by at least three items. Furthermore, all solutions provided plausible and meaningful factors. The first factor in each of the solutions can be summarised as patients’ perception of direct nursing care activities, whereas the second factor represents ‘patients’ perception of the guidance provided by nurses’. In the four-factor solution, this factor splits into guidance on activities of daily living’, and ‘medical and illness-related aspects. Items 31 and 32 were the only items representing patients’ conclusions about future hospital stays based on their experience of nursing care; in the three-factor and four-factor solutions, these formed one factor representing patient loyalty.

Results of the CFA

We conducted CFA for the six possible factor solutions. For all models that included items 31 and 32 as a separate factor (3–8 factor extraction), a problem appeared during the estimation because the input variance-covariance matrix was not positive definite. Non-positive definite variance-covariance matrices can have various causes, two of which might apply to our data: multicollinearity and the presence of too few indicators per factor.⁴⁸ We, therefore, decided to exclude items 31 and 32 from the CFA model. Doing so was also plausible with regard to the content of the items: the loyalty of patients to a hospital based on their experience of nursing care is only an indirect indicator (or rather a consequence) of the quality of nursing care and of patient satisfaction. This characteristic distinguishes these items from the rest of the scale. The only other item that asks patients about an indirect consequence of the quality of nursing care is item 30

(‘After my hospital stay, I had more/the same amount/less trust in the nurses’). For reasons of consistency, we excluded this item as well (which was only relevant for the two-factor solution because it had already been excluded from all other models).

The overall goodness-of-fit indices derived from CFA after excluding the three items (see online supplemental table 4) for CFI and TLI suggested that all models had good incremental fit. The same held for SRMR and roughly for RMSEA. Because RMSEA was likely to be upwardly biased and the values exceeded the recommended threshold only slightly, we considered the overall goodness of fit to be adequate.

In terms of identification and the stability of the factor solution, the two-factor model was the most suitable because no factor was represented by too few items and the factor structure was very robust compared with that of the models resulting from the extraction of 5–8 factors. However, with respect to the parsimony of the models, extracting only two factors, each represented by a broad set of items, was disadvantageous. Furthermore, some researchers may wish to apply a finer-grained scale when empirically investigating patient-perceived quality of nursing care in acute care settings.

One approach to combine model robustness and parsimony is to use the information gained by the different factor solutions to test for a multidimensional factor structure. The border between the two factors of the two-factor model remained robust across all other factor solutions. The only difference was that the two factors split

up into different, finer-grained solutions when more than three factors were extracted. Therefore, it was plausible to assume that these two factors correspond to more general higher-order latent variables that affect the way patients perceive the more specific lower-order dimensions of nursing care. Because of this, we chose to favour a second-order model, which combines the two models resulting from the two-factor and eight-factor extractions (see figure 3).

Due to the lack of robust results concerning the lower-order dimensionality of factor 1, we included only lower-order dimensions for factor 2 in our proposed model. The resulting factor structure seemed reasonable. The first factor represents patients’ perception of direct nursing care activities and the second captures patients’ perception of the guidance provided by nurses. The latter includes three lower-order dimensions of nurses’ guidance, namely guidance on (1) taking medication and using medical supplies and devices at home, (2) activities of daily living (exercise, nutrition) and (3) self-help and the situation after discharge from hospital.

The overall goodness-of-fit indices suggested that the proposed second-order model fit the data even better than each first-order model (see online supplemental table 4). All indices met the cut-off criteria proposed by Hu and Bentler.⁴⁹ We, therefore, refrained from modifying the model based on modification indices and used the remaining part of the randomly split sample to confirm the proposed model once again using CFA. The results remained stable, and all goodness-of-fit indices

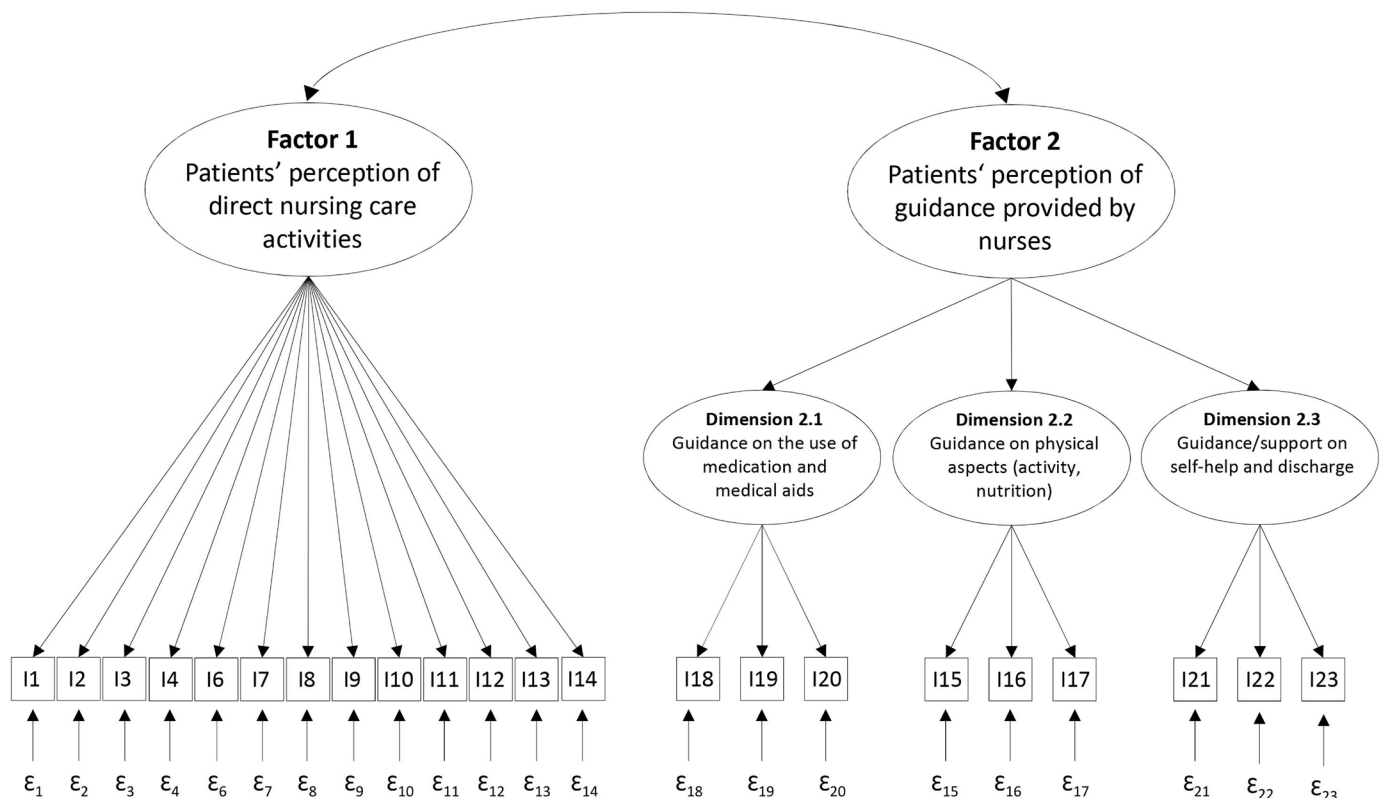


Figure 3 Proposed two-order model representing Patients’ Experience of Nursing Quality in Acute Hospitals (PENQuAH).

still met the cut-off criteria (SRMR=0.021; RMSEA=0.054; CFI=0.990; TLI=0.989. The CFA results for all other factor solutions remained stable as well.).

Reliability and validity

The GLB averaged over 10 imputed datasets was 0.94 for factor 1 and 0.96 for factor 2. Cronbach's alpha was 0.93 for factor 1 (95% CI 0.93 to 0.94) and 0.94 for factor 2 (95% CI 0.94 to 0.94). Hence, we conclude adequate reliability for our sample.^{65 66}

Content analysis of the open-response item asking whether there was anything else the patient considered important regarding nursing quality revealed no categories that were not already part of the questionnaire.⁶⁰

Construct validity was supported by Spearman's correlation coefficients. PENQuAH factors 1 and 2 were both highly correlated with patients' loyalty towards the hospital based on their experience with nursing care (Spearman's $r=0.72$ and 0.64 ; 95% CIs 0.71 to 0.73 and 0.62 to 0.66, respectively), and weakly correlated with patient falls (Spearman's $r=-0.08$ and -0.07 ; 95% CIs -0.10 to -0.05 and -0.09 to -0.04 , respectively) and with whether patients needed more help with activities of daily living since their hospital stay (Spearman's $r=-0.12$ and -0.12 ; 95% CIs -0.15 to -0.09 and -0.15 to -0.09 , respectively).

We applied the $CI_{CFA}(sys)$ method proposed by Rönkkö and Cho to assess discriminant validity.⁶² We obtained upper limits of the 95% CIs for the estimated factor correlations of 0.89 for the correlation between factors 1 and 2, and of 0.88, 0.92 and 0.89 for the intercorrelations of the second-order factors 2.1, 2.2 and 2.3, respectively. These results imply a marginal discriminant validity problem for all factor intercorrelations except for the link between factors 2.1 and 2.3, for which a moderate problem is implied. However, Rönkkö and Cho warn against mechanically using correlation cut-offs, because a strong correlation does not necessarily mean that there is a discriminant validity problem if it is expected based on theory or prior empirical results.⁶² Given that the PENQuAH factors are supposed to measure one common construct of nursing quality, we expected a strong correlation and, thus, assumed that the factor intercorrelations were tolerable.

DISCUSSION AND AGENDA FOR FUTURE RESEARCH

We developed and validated a new instrument, the PENQuAH scale, based on a structured search of the literature on existing scales for measuring patient-perceived quality of nursing care. Our literature search revealed that previous scales are highly heterogeneous in terms of their scope, comprehensiveness, dimensionality and the type and extent of psychometric evaluation to which they have been subjected. With the PENQuAH scale, we address the need for a scale that is able to (a) measure patient-perceived quality of nursing care in the German acute care sector and (b) capture the multidimensional

nature of the quality of nursing care and has undergone adequate psychometrical testing.

We believe that the PENQuAH scale represents a valuable contribution to the study, practice and management of nursing care given the many challenges facing the profession, including staff shortages, new threats such as pandemics, and the growing population of elderly and multimorbid patients. A valid measure of the quality of nursing care is also of practical and political importance. For instance, the results of a recent umbrella review suggest that the quality of nursing care is one of the nursing-sensitive patient outcomes with the strongest evidence of a significant relationship with nurse staffing.²⁸ Considering that nurse staffing and staffing regulations are widely debated, being able to measure the quality of nursing care using a valid and reliable scale can help policy and decision-makers set staffing standards or minimum staffing regulations that improve patient care and staff well-being.

Based on exploratory and CFAs, we have proposed a second-order model that includes the two higher-order factors: 'patients' perception of direct nursing care activities' and 'patients' perception of guidance provided by nurses'. The model is promising in terms of its goodness of fit, the plausibility and meaningfulness of its dimensions, and its ease of use. Indeed, the PENQuAH scale is intended to capture a broad perspective on patient-perceived nursing quality without demanding too much time or effort of patients. We consider the model optimal for this purpose because using two plausible higher-order factors offers good scope for researchers who aim to analyse the overall construct of patients' experience of nursing care, and the more specific lower-order dimensions of patients' perception of nursing guidance can be used for more detailed subanalyses if required.

By capturing patients' experience of the quality of guidance provided by nurses and the quality of nurses' discharge preparation, PENQuAH goes beyond the scales we identified in our literature search and includes a dimension and subdimension, respectively, which were identified as highly relevant based on our expert interviews. Indeed, of the 32 scales we considered, only 6 included single items related to guidance, mostly on whether patients received understandable explanations/instructions regarding their medication or treatment programme, or global items on support with managing their own health. Each of these scales covered only a very restricted scope of the quality of guidance. Furthermore, with only one exception, all of the scales we identified in our review considered only the guidance provided by medical staff in general and did not focus on nursing care. This is unfortunate given that the analysis of our expert interviews suggested that providing advice and guidance was a highly relevant category of patient-perceived quality of nursing care, with the experts mentioning a total of 27 different indicators within this category alone. This seems plausible because aspects of guidance such as telling or showing patients how they can and should move, what to



consider with respect to eating, drinking and personal care, and how to use medical supplies and devices at home is likely to promote patients' sense of security, autonomy and self-efficacy. Accordingly, nurses' competence in employing educational and communication strategies to encourage patients to pursue their health goals autonomously is an integral part of international nursing practice standards and regulations.^{67–69}

Furthermore, by including the subdimension 'guidance/support with respect to self-help and hospital discharge', PENQuAH differs from previous scales by combining measures of the quality of acute nursing care with that of nurses' discharge preparation. In our literature search, we identified only one other scale that included discharge preparation within the framework of overall care quality, but the respective items are focused on the support provided by hospital staff in general, not specifically by nurses.⁷⁰ Considering, in particular, the growing number of multimorbid patients and decreases in the average length of hospital stays, supporting patients with hospital discharge and taking care of their own health has become increasingly important. We, thus, consider this subdimension to be an essential part of our scale and our goal to capture a holistic view of patient-perceived nursing care quality.

Our study has a number of important limitations, each of which offers avenues for further research. First, due to the heterogeneity of theoretical concepts, we were not able to clearly demarcate our definition of the construct 'quality of nursing care' a priori. Our structured literature search was designed to help address this issue insofar as it sought to identify how the construct had been defined in previous scales. Categorising the set of items identified from the literature search and complementing the results with indicators identified from expert interviews allowed us to outline the construct, however, in a data-based way. Nevertheless, we advise researchers, clinicians and managers who intend to use the PENQuAH scale to scrutinise whether our definition of the quality of nursing care fits their area of application.

Second, our review of the literature on existing instruments has some limitations. Although we had an a priori internal search protocol which we did not modify after it had been finalised, we did not register it because we were conducting a structured search of the literature rather than a systematic review. Moreover, we did not perform study selection in duplicate, creating a risk that some relevant studies were not identified. However, because our review covers a broad range of existing scales, it is probable that we reached saturation with regard to potential factors/dimensions and items and have captured the heterogeneity of previous scales in this field.

Third, our aim was to cover indicators not only of the nursing care quality that can be measured during the hospital stay, but also those of the potential consequences afterwards. Unfortunately, however, the five items covering assistance with various activities of daily living after hospital discharge showed pairwise intercorrelations

with the remaining items that were below the threshold considered adequate for factor analysis.⁶³ Although we, therefore, had to exclude these items, we were able to use them to test the construct validity of the remaining scale. Furthermore, we propose that they be used as a separate construct because they offer excellent opportunities for additional analysis. Future researchers may wish to examine further whether and how pre-discharge and post-discharge indicators of nursing care quality can be combined in one scale to measure the same underlying construct of nursing care quality.

Fourth, based on our set of items, we were not able to identify a robust structure of lower-order dimensions for factor 1 of our proposed model, which represents 'patients' perception of direct nursing care activities'. The factor solutions resulting from the extraction of six or more factors suggest that the fulfilment of essential needs, provision of sufficient and understandable information, and interpersonal behaviour might be relevant to lower-order dimensions of 'patients' perception of direct nursing care activities'. Because factor 1 forms a very global indicator of nursing care quality, the model might benefit from its further division into lower-order dimensions. The insights from our analyses can nevertheless be used as a basis to extend the items into potentially relevant lower order dimensions and enable further examination of the scale's dimensionality.

Fifth, in the present model, the lower-order dimensions of factor 2 are each represented by only three items, which corresponds to the minimum number of recommended indicators per factor. To achieve strong and solid factors, five or more indicators with high factor loadings would be desirable.³⁸ Although our large sample size may partially offset the stability issue, an extension of items would, again, be valuable to increase model stability.

Sixth, due to the cross-sectional nature of our dataset, we were not able to test PENQuAH's test-retest reliability or predictive validity. PENQuAH factors 1 and 2 were both highly correlated with patients' anticipated loyalty towards the hospital based on their experience of nursing care. This might imply that PENQuAH could be predictive of patients' actual decision to choose the same hospital again—an outcome that might be highly relevant for managers and clinicians. Future research should test the scale's reliability and validity using longitudinal data.

Lastly, patients' perception of the quality of nursing care might differ depending on their cultural context, the organisation of the local healthcare system, and the role of the nursing professions within it. We, thus, encourage researchers to validate the PENQuAH scale based on additional samples and—because there is a general lack of psychometrically validated scales measuring patient-perceived quality of nursing care in acute care hospitals—translate it to other languages to allow it to be validated in other patient populations worldwide.

Conclusion

With this paper, we present a comprehensive overview of existing scales for measuring patient-perceived nursing quality and add to the field by developing and validating the PENQuAH scale. We developed the scale using systematic methodology, including a structured literature search to generate a pool of existing items on the subject, as well as expert interviews to broaden the perspective in relevant ways. We used cognitive pretesting to evaluate and refine the different items. Importantly, we based our psychometrical validation of the scale, which used exploratory and CFA, on a survey of a large sample of patients who had recently been hospitalised. Applying best practice techniques for the exploratory and CFA specifications, we tested and compared different factor solutions, all of which showed adequate overall goodness of fit.

Based on the results, we propose a second-order model including the two higher-order dimensions ‘patients’ perception of direct nursing care activities’ (13 items) and ‘patients’ perception of guidance provided by nurses’ (9 items evenly distributed across 3 subdimensions). The model is promising with regard to reliability and validity measures, goodness of fit, the plausibility and meaningfulness of its dimensions, and its ease of use. The PENQuAH scale is intended to capture a broad perspective on patient-perceived nursing quality without demanding too much time or effort of patients. For applications that aim to focus on the finer-grained analysis of patient-perceived quality of nursing care, future researchers may wish to conduct further research on the subdimensions of the factor ‘patients’ perception of direct nursing care activities’.

Acknowledgements We acknowledge support from the Open Access Publication Fund of the University of Wuppertal.

Contributors KSB was responsible for the overall content as the guarantor. As such, she was responsible for the project administration, was the main researcher responsible for writing the manuscript, extracted data from existing scales to create the structured overview, developed the methodology for the psychometric evaluation, did the statistical analyses and interpreted the results. UK-H was the main researcher responsible for developing and conducting the methodology for the structured literature review and the development of the draft questionnaire and wrote the sections of the draft manuscript reporting on these steps. VW was the main researcher responsible for the review and editing of the manuscript, and for the supervision of research planning and execution, and was responsible for project administration and funding acquisition. GM conducted expert interviews, contributed to item selection and evaluation in the expert workshop, critically reviewed the draft manuscript, was responsible for the supervision of the research planning and execution and for funding acquisition. SF conducted expert interviews, contributed to item selection and evaluation in the expert workshop, critically reviewed the draft manuscript, was responsible for the supervision of the research planning and execution and for funding acquisition. All authors contributed to the conceptualisation, critically reviewed and approved the final draft of the manuscript.

Funding This work was supported by the German Federal Joint Committee, Grant/Award Number: 01VSF17038.

Disclaimer The funder did not influence the design, analysis and interpretation of data.

Competing interests None declared.

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Scale development section for further details.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and a declaration of compliance with the terms of use and ethical standards of the University of Hamburg’s WiSo Laboratories was approved on 15 January 2019 (no approval number provided). We obtained written informed consent from all survey participants before they took part in the survey. Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available on reasonable request. The data are in large part owned by a German statutory health insurer, Techniker Krankenkasse. To fulfil the legal requirements to obtain the data, researchers must obtain permission for a specific research question from the German Federal (Social) Insurance Office. Additionally, researchers must conclude a contract with the statutory health insurer regarding data access.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iD

Vera Winter <http://orcid.org/0000-0001-7087-2400>

REFERENCES

- Phillips J, Malliaris AP, Bakerjian D. *Nursing and Patient, Safety: Patient Safety Primer*. 2021. Available: <https://psnet.ahrq.gov/primer/nursing-and-patient-safety>
- World Health Organization. *State of the world’s nursing 2020: investing in education, jobs and leadership*. Geneva. 2020.
- Sochalski J. Is more better?: the relationship between nurse staffing and the quality of nursing care in hospitals. *Med Care* 2004;42(2 Suppl):1167–73.
- Zhu X, You L, Zheng J, *et al*. Nurse staffing levels make a difference on patient outcomes: a Multisite study in Chinese hospitals. *J Nurs Scholarsh* 2012;44:266–73.
- Cho E, Lee N-J, Kim E-Y, *et al*. Nurse staffing level and overtime associated with patient safety, quality of care, and care left undone in hospitals: A cross-sectional study. *Int J Nurs Stud* 2016;60:263–71.
- Aiken LH, Sloane DM, Ball J, *et al*. Patient satisfaction with hospital care and nurses in England: an observational study. *BMJ Open* 2018;8:e019189.
- Kutney-Lee A, McHugh MD, Sloane DM, *et al*. Nursing: a key to patient satisfaction. *Health Aff (Millwood)* 2009;28:w669–77.
- Martolf GR, Gibson TB, Benevent R, *et al*. An examination of hospital nurse staffing and patient experience with care: differences between cross-sectional and longitudinal estimates. *Health Serv Res* 2016;51:2221–41.
- Lucero RJ, Lake ET, Aiken LH. Nursing care quality and adverse events in US hospitals. *J Clin Nurs* 2010;19:2185–95.
- Kalisch BJ, Xie B, Dabney BW. Patient-reported missed nursing care correlated with adverse events. *Am J Med Qual* 2014;29:415–22.
- Donabedian A. n.d. The definition of quality and approaches to its assessment. *Health Admin press*; 1980. (explorations in quality assessment and monitoring; vol 1).
- Beattie M, Murphy DJ, Atherton I, *et al*. Instruments to measure patient experience of Healthcare quality in hospitals: a systematic review. *Syst Rev* 2015;4:97.
- Beattie M, Shepherd A, Howieson B. Do the Institute of medicine’s (IOM’s) dimensions of quality capture the current meaning of quality in health care? – an integrative review. *J Res Nurs* 2013;18:288–304.
- Acosta AM, Lima MADS, Marques GQ, *et al*. Brazilian version of the care transitions measure: translation and validation. *Int Nurs Rev* 2017;64:379–87.

- 15 Jenkinson C, Coulter A, Bruster S. The picker patient experience questionnaire: development and validation using data from in-patient surveys in five countries. *Int J Qual Health Care* 2002;14:353–8.
- 16 Lynn MR, McMillen BJ, Sidani S. Including the provider in the assessment of quality care: development and testing of the nurses' assessment of quality scale - acute care version. *J Nurs Care Qual* 2007;22:328–36.
- 17 Rehnström L, Christensson L, Leino-Kilpi H, et al. Adaptation and Psychometric evaluation of the Swedish version of the good nursing care scale for patients. *Scand J Caring Sci* 2003;17:308–14.
- 18 Wolf ZR, Giardino ER, Osborne PA, et al. Dimensions of nurse caring. *Image: The Journal of Nursing Scholarship* 1994;26:107–12. 10.1111/j.1547-5069.1994.tb00927.x Available: <https://sigmapubs.onlinelibrary.wiley.com/toc/15475069a/26/2>
- 19 Columbe KH, Yeakel S, Maljanian R, et al. Caring behaviors inventory: analysis of responses by hospitalized surgical patients. *Outcomes Manag* 2002;6:138–41.
- 20 Edvardsson D, Mahoney A-M, Hardy J, et al. Psychometric performance of the English language six-item caring Behaviours inventory in an acute care context. *J Clin Nurs* 2015;24:2538–44.
- 21 Radwin LE, Cabral HJ. Trust in nurses scale: construct validity and internal reliability evaluation. *J Adv Nurs* 2010;66:683–9.
- 22 Labarere J, Francois P, Auquier P, et al. Development of a French inpatient satisfaction questionnaire. *Int J Qual Health Care* 2001;13:99–108.
- 23 Goh ML, Ang EN, Chan Y, et al. Psychometric testing of the revised humane caring scale for adult patients in Singapore. *Nursing & Health Sciences* 2015;17:370–6. 10.1111/nhs.12199 Available: <https://onlinelibrary.wiley.com/toc/14422018/17/3>
- 24 Suhonen R, Leino-Kilpi H, Välimäki M. Development and Psychometric properties of the individualized care scale. *J Eval Clin Pract* 2005;11:7–20.
- 25 Coleman EA, Mahoney E, Parry C. Assessing the quality of preparation for Posthospital care from the patient's perspective: the care transitions measure. *Med Care* 2005;43:246–55.
- 26 Laschinger HS, Hall LM, Pedersen C, et al. A Psychometric analysis of the patient satisfaction with nursing care quality questionnaire: an actionable approach to measuring patient satisfaction. *J Nurs Care Qual* 2005;20:220–30.
- 27 Silvera GA, Clark JR. Patient evaluations of the interpersonal care experience (ICE) in U.S. hospitals: A factor analysis of the HCAHPS survey. *Patient Experience Journal* 2016;3:101–9.
- 28 Blume KS, Dietermann K, Kirchner-Heklau U, et al. Staffing levels and nursing-sensitive patient outcomes: umbrella review and qualitative study. *Health Serv Res* 2021;56:885–907.
- 29 Saldaña J. *The coding manual for qualitative researchers, 3rd edn.* Los Angeles, Calif., London, New Delhi, Singapore, Washington DC: Sage, 2016.
- 30 Fitzpatrick. *Development of New Models for Collection and Use of Patient Experience Information in the NHS – PRP 070/0074: Final Report.* Oxford: Picker Institute Europe, 2014.
- 31 Wild D, Grove A, Martin M, et al. Principles of good practice for the translation and cultural adaptation process for patient-reported outcomes (PRO) measures: report of the ISPOR. *Value in Health* 2005;8:94–104.
- 32 Lenzner T, Neuert C, Otto W. *Cognitive Pretesting.* Mannheim, Germany: GESIS - Leibniz Institute for the Social Sciences, 2016.
- 33 Dietermann K, Winter V, Schneider U, et al. The impact of nurse staffing levels on nursing-sensitive patient outcomes: a Multilevel regression approach. *Eur J Health Econ* 2021;22:833–46.
- 34 Winter V, Dietermann K, Schneider U, et al. Nurse staffing and patient-perceived quality of nursing care: a cross-sectional analysis of survey and administrative data in German hospitals. *BMJ Open* 2021;11:e051133.
- 35 Winter V, Blume KS, Schreyögg J, et al. Pflegeintensität und Pflegesensitive Ergebnisindikatoren in Deutschen Krankenhäusern.: Ergebnisbericht Zum Vom Innovationsfonds Geförderten Versorgungsforschungsprojekt (Förderkennzeichen: 01Vsf17038). 2022. Available: <https://innovationsfonds.g-ba.de/projekte/versorgungsforschung/ppe-pflegeintensitaet-und-pflegesensitive-ergebnisindikatoren-in-deutschen-krankenhaeusern.155>
- 36 Bundesgesundheitsministerium für Gesundheit (BMG). Pflegebedürftig - was Nun?: Hier Erfahren SIE, Wie und wo SIE Einen Antrag auf Pflegeleistungen Stellen Können und Wie Eine Feststellung der Pflegebedürftigkeit Erfolgt. 2023. Available: <https://www.bundesgesundheitsministerium.de/themen/pflege/online-ratgeber-pflege/pflegebeduerftig-was-nun.html#c26927>
- 37 Fabrigar LR, Wegener DT, MacCallum RC, et al. Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods* 1999;4:272–99.
- 38 Costello AB, Osborne JW, Osborne J. Best practices in exploratory factor analysis: four recommendations for getting the most from your analysis // best practices in exploratory factor analysis: four recommendations for getting the most from your analysis. *Pract Assessm Res Evaluat* 2005;10.
- 39 Russell DW. In search of underlying dimensions: the use (and abuse) of factor analysis in personality and social psychology bulletin. *Pers Soc Psychol Bull* 2002;28:1629–46.
- 40 Worthington RL, Whittaker TA. Scale development research. *The Counseling Psychologist* 2006;34:806–38.
- 41 Cabrera-Nguyen P. Author guidelines for reporting scale development and validation results in the Journal of the society for social work and research. *J Soc SocWork Res* 2010;1:99–103.
- 42 Auerswald M, Moshagen M. How to determine the number of factors to retain in exploratory factor analysis: A comparison of extraction methods under realistic conditions. *Psychol Methods* 2019;24:468–91.
- 43 Truxillo C. *Maximum Likelihood Parameter Estimation with Incomplete Data.* Cary, North Carolina: SAS Users Group International 30 Proceedings Paper, 2005: 111–30.
- 44 Graham JW, Cumsille PE, Shevok AE. Methods for handling missing data. In: Weiner IB, Velicer WF, Schinka JA, et al., eds. *Research Methods in Psychology.* Hoboken, N.J: Wiley, 2013: 109–41.
- 45 Collins LM, Schafer JL, Kam C-M. A comparison of inclusive and restrictive strategies in modern missing data procedures. *Psychol Methods* 2001;6:330–51.
- 46 Asparouhov T, Muthén B. n.d. Multiple imputation with Mplus; 2010 Sep 29 version 2.
- 47 Muthén BO, DuSH, Sipsic D. Robust inference using weighted least squares and quadratic estimating equations in latent variable modeling with categorical and continuous outcomes. 1997.
- 48 Brown TA. *Confirmatory factor analysis for applied research, 2nd edn. (Methodology in the social sciences).* New York, London: The Guilford Press, 2015.
- 49 Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Struct Equat Model: A Multidisciplinary J* 1999;6:1–55.
- 50 Shi D, Lee T, Fairchild AJ, et al. Fitting Ordinal factor analysis models with missing data: A comparison between Pairwise deletion and multiple imputation. *Educ Psychol Meas* 2020;80:41–66.
- 51 Wu W, Jia F, Enders C. A comparison of imputation strategies for Ordinal missing data on Likert scale variables. *Multivariate Behav Res* 2015;50:484–503.
- 52 Graham JW, Olchowski AE, Gilreath TD. How many Imputations are really needed? some practical Clarifications of multiple imputation theory. *Prev Sci* 2007;8:206–13.
- 53 White IR, Royston P, Wood AM. Multiple imputation using chained equations: issues and guidance for practice. *Stat Med* 2011;30:377–99.
- 54 Bodner TE. What improves with increased missing data Imputations? structural equation modeling: A Multidisciplinary Journal. 2008;15:651–75.
- 55 Trizano-Hermosilla I, Alvarado JM. Best alternatives to Cronbach's alpha reliability in realistic conditions: Congeneric and Asymmetrical measurements. *Front Psychol* 2016;7:769.
- 56 Sijtsma K. On the use, the misuse, and the very limited usefulness of Cronbach's alpha. *Psychometrika* 2009;74:107–20.
- 57 Peters G-JY. userfriendlyscience: Quantitative analysis made accessible. . 2018 Available: <https://userfriendlyscience.com>
- 58 R Core Team. *R: A Language and Environment for Statistical Computing: Version R.4.2.0.* Vienna, Austria, 2022. Available: <https://www.R-project.org>
- 59 Peters G-JY. The alpha and the Omega of scale Reliability and validity: why and how to abandon Cronbach's alpha and the route towards more comprehensive assessment of scale quality. *Europ Health Psycholog* 2014;16:56–69.
- 60 Kirchner-Heklau U, Meyer G, Fleischer S. Was Patient_Innen an Pflegequalität Noch Wichtig ist: Inhaltsanalyse Einer Offenen Frage in Einem online-Fragebogen [What patients judge as important regarding nursing quality: Content analysis of patients' responses to an open-ended question within an online survey]. *Pflege* 2022;35.
- 61 Kane RL, Shamliyan TA, Mueller C, et al. The Association of registered nurse staffing levels and patient outcomes: systematic review and meta-analysis. *Med Care* 2007;45:1195–204.
- 62 Rönkkö M, Cho E. An updated guideline for assessing discriminant validity. *Organizational Research Methods* 2022;25:6–14.
- 63 Tabachnick BG, Fidell LS. *Using multivariate statistics, 6th. Edn.* (always learning). Boston, Munich: Pearson. 2013.
- 64 Kaiser HF. An index of factorial simplicity. *Psychometrika* 1974;39:31–6.

- 65 Ponterotto JG, Ruckdeschel DE. An overview of coefficient alpha and a reliability matrix for estimating adequacy of internal consistency coefficients with psychological research measures. *Percept Mot Skills* 2007;105:997–1014.
- 66 Taherdoost H. Validity and reliability of the research instrument; how to test the validation of a questionnaire/survey in a research. *SSRN Journal* 2016.
- 67 American Nurses Association. *Nursing: Scope and standards of practice, 3rd edn*. Silver Spring, Maryland: American Nurses Association, 2016.
- 68 Nursing and Midwifery Council. *Standards for competence for registered nurses*. London, 2010.
- 69 Pflegeberufe-Ausbildungs- und Prüfungsverordnung - Pflaprv [ordinance concerning training and examinations for nursing] - annex 2. 2018.
- 70 Pettersen KI, Veenstra M, Guldvog B, *et al*. The patient experiences questionnaire: development, validity and reliability. *Int J Qual Health Care* 2004;16:453–63.
- 71 Page MJ, McKenzie JE, Bossuyt PM, *et al*. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71:71..

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 1

Source 1: Search strategy for the structured literature review

We applied the following search strategy: (“nursing care quality” OR “patient satisfaction”) AND (instrument OR scale OR measure OR assessment OR inventory OR survey OR questionnaire) AND (patient OR proxy OR family OR friends) AND (hospital OR “acute care”). The search was conducted in May 2018. Additionally, we asked peer researchers in the field of nursing science to suggest publications reporting on the measurement of patient-perceived nursing quality and contacted one author to ask for an unpublished German translation of a well-known scale (Glarcher, 2014). Additionally, we performed backward citation tracking. Inclusion and exclusion criteria were defined in consensus meetings among all authors. One researcher (UKH) screened all publications to assess their adherence to these criteria. In cases where the decision regarding inclusion or exclusion of a publication was unclear, a second researcher (KSB) was involved, and a consensus was reached through an iterative process.

We included publications that

- described the development, evaluation, refinement and/or translation of a scale measuring nursing quality from the patient’s perspective,
- had been published in German or English (without any restrictions regarding the publication year), and
- were applicable to acute care settings.

We excluded publications that

- described scales designed exclusively for use in paediatric, psychiatric, intensive care or nursing home settings, or
- did not focus on the scale itself (for example, described its application only).

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 1

Table 1: Overview of Identified Scales for Measuring the Quality of Nursing Care from Patients' Perspective

Scale (Reference)	Type	Language (Scale)	Factors/Dimensions	Number of items*	Validation methods	Sample size	Focus
Care Transition Measure – Brazilian Portuguese 15 item version (CTM-15) <u>Original scale:</u> CTM Acosta et al. (2017)	T	Brazilian Portuguese	4 factors (based on EFA/PCA & CFA) 1. Health management preparation 2. Medication understanding 3. Important preferences 4. Care plan	15	EFA/PCA: with varimax rotation 4-factor solution explaining 72% of total variance; factor loadings: 0.456 - 0.835 Reliability measures Test-retest: Student's t-test with no statistical difference; p-value = 0.301 <u>Internal consistency reliability:</u> Cronbach's $\alpha = 0.93$ Validity measures Content validity: assessed by expert committee and clarity rate of items in pre-testing (80-100% per item) Criterion validity: comparison of CTM-15 and CTM-3 scores; no significant difference (p = 0.119)	150; sub-sample for test-retest-analysis: n= 30	GenHC SpecNC
Care Transition Measure – Brazilian Portuguese three item version (CTM-3) <u>Original scale:</u> CTM Acosta et al. (2017)	T	Brazilian Portuguese	Uni-dimensional	3	Reliability measures Test-retest: Student's t-test with no statistical difference; p-value CTM-15 = 0.301 (0.261) <u>Internal consistency reliability:</u> Cronbach's $\alpha = 0.66$ Validity measures Criterion validity: comparison of CTM-15 and CTM-3 scores; no significant difference (p = 0.119)	150; sub-sample for test-retest-analysis: n= 30	GenHC SpecNC
Care Transition Measure (CTM) Coleman et al. (2005)	nD	English	4 factors (based on EFA & CFA) 1. Support for self-management 2. Considering patient preferences 3. Critical understanding 4. Care plan	15	EFA: with maximum likelihood. Multimethod approach: Items as a) continuous b) categorical (orthogonal + oblique rotation) <i>Continuous indicators (Categorical indicators in parentheses)</i> CFA: chi-squared baseline model = 1989.74 (2890.45) / default model = 267.19 (54.46) CFI = 0.96 (0.99); RMSE = 0.07 (-); SRMR = 0.05 (0.05); WRMR = - (0.96) Reliability measures <u>Internal consistency reliability:</u> Cronbach's $\alpha = 0.93$ Validity measures Construct validity: ability to discriminate among patients who were hypothesized to differ on the quality of their care transition; significantly lower CTM scores for patients with subsequent emergency visits or readmissions (p = 0.014 and p = 0.045); Convergence with (8 out of 9) reported negative post-hospital experiences	200	GenHC SpecNC
Caring Behaviors Inventory (CBI) – short form <u>Original scale:</u> CBI Edvardsson et al. (2015)	V of SF	English	Uni-dimensional	6	PCA: with oblique rotation Single-factor solution explained 65% of variance; factor loadings: 0.62 - 0.89 Reliability measures <u>Internal consistency reliability:</u> Cronbach's $\alpha = 0.89$; Item-total corr.: 0.51 - 0.82	210	OnlyNC

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 1

Scale (Reference)	Type	Language (Scale)	Factors/Dimensions	Number of items*	Validation methods	Sample size	Focus
Caring Behaviors Inventory (CBI) Wolf et al. (1994)	nD	English	5 factors (based on EFA) 1. Respectful deference to others 2. Assurance of human presence 3. Positive connectedness 4. Professional knowledge and skills 5. Attentiveness to the others' experience	42	PCA/EFA: with varimax rotation 6-factor solution explaining 57% of total variance; factor loadings: 0.40 - 0.78; eigenvalues: 1.03 – 15.71; 1 factor dropped Reliability measures Test-retest reliability (nurse sample): $r = 0.96$ Corr. between subscales: 0.48 - 0.76 <u>Internal consistency reliability:</u> Cronbach's $\alpha = 0.96$; Cronbach's α subscales: 0.82 - 0.92 Validity measures Content validity: assessed by expert panel Construct validity: unpaired t-test comparing nursing staff and patient responses; $t = 3.01$; $p = 0.003$	541	OnlyNC
Caring Behaviors Inventory (CBI) 24-Item version <u>Original scale:</u> CBI Wu et al. (2006)	SF	English	4 factors (based on EFA) 1. Assurance 2. Knowledge and skills 3. Respectful 4. Connectedness	24	EFA: with varimax rotation 4-factor solution explaining 68% of total variance; factor loadings: 0.50 - 0.82; eigenvalues: 1.0 – 12.67 Reliability measures Test-retest reliability: $r = 0.82$ (nurses) / $r = 0.88$ (patients) Pearson corr. between test-retest subscales: 0.67 - 0.91 <u>Internal consistency reliability:</u> Cronbach's $\alpha = 0.96$; Cronbach's α subscales: 0.82 - 0.92 Validity measures Convergent validity: corr. with patient satisfaction score: $r = 0.62$ Construct validity: moderate corr. with patient characteristics: $r = -0.11$ -0.19	362 (patients) / 90 (nurses)	OnlyNC SpecNC
Caring Behaviors Inventory (CBI) short form Columbe et al. (2002)	SF	English	Uni-dimensional	6	Subset identification Pearson corr. between CBI items and total CBI score + regression analysis; more than 95% of total variance explained; $R = 0.98$ (adjusted R-squared = 0.96) Reliability measures <u>Internal consistency reliability:</u> Cronbach's $\alpha = 0.89$ Validity measures Corr. with 42-item CBI = 0.96 ($p < 0.001$) / GNC score = 0.61 ($p < 0.001$) / GNC score dichotomized = 0.59 ($p < 0.001$)	354	OnlyNC
Chinese surgical inpatient satisfaction and comfort questionnaire[‡] Liu et al., 2021	nD	Provided in English; original presumably in Chinese (not explicitly stated)	7 dimensions (based on EFA and adjusted) 1. Medical care 2. Nursing care 3. Environment and logistics 4. Postoperative and hospitalization experiences 5. Feeling nervous and afraid 6. Operating room services 7. Visiting	65	EFA/PCA: with varimax rotation 9 factor solution grouped into 9 dimensions explaining 68% of total variance; factor loadings: 0.41 – 0.89 CFA: confirmed 7-dimension model Chi-squared = 2156; chi-squared ratio = 2.0; non-normed fit index = 0.93; CFI = 0.96; IFI = 0.96; GFI = 0.94; SRMR = 0.04; RMSEA = 0.08; Reliability measures Test-retest reliability: ICC = 0.77 – 0.96 <u>Internal consistency reliability:</u> Cronbach's α subscales: 0.83 – 0.96 Validity measures Content validity: participant feedback Construct validity: see EFA Convergent validity: item-total-corr.: 0.43 – 0.92 Discriminant validity: item-correlation with corresponding subscale: 0.03 – 0.65	1,582	GenHC

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 1

Scale (Reference)	Type	Language (Scale)	Factors/Dimensions	Number of items*	Validation methods	Sample size	Focus
French inpatient experience questionnaire – refined version Original scale: French inpatient experience questionnaire Labarère et al. (2004)	R	French	7 dimensions (based on PCA) 1. Medical information 2. Nursing care 3. Living arrangements 4. Discharge management 5. Coordination 6. Physician care 7. Convenience	29	PCA: with varimax rotation 7-factor solution explaining 62% of total variance Reliability measures <u>Internal consistency reliability:</u> Cronbach's α subscales: 0.62 - 0.9 (+ one outlier: 0.39) Internal consistency coefficient total scale: 0.93 (medical patients) / 0.94 (surgical patients); Item-corr. with corresponding subscale: 0.43 - 0.78; each higher than with other scales Inter-scale corr.: 0.23 – 0.64 Validity measures External construct validity: testing empirical hypotheses (most hypotheses could be confirmed) Internal construct validity: see PCA	3879	GenHC
French inpatient experience questionnaire Labarere et al. (2001)	nD	French	6 factors (based on PCA) 1. Nursing care 2. Communication 3. Discharge planning and continuity 4. Physician care 5. Living arrangements 6. Convenience	30	PCA: with varimax rotation 7-factor solution with the respective factors explaining 4 - 35% of total variance; factor loadings: 0.44 - 0.75 Reliability measures <u>Internal consistency reliability:</u> Cronbach's α subscales: 0.67 - 0.86; inter-scale corr. matrix: 0.45 - 0.63; item-corr. with corresponding subscale: 0.43-0.78; each higher than with other subscales Validity measures Content validity: comparison with similar scales Construct validity: comparison with dim. of patient satisfaction taxonomy and PCA ($p < 0.01$)	692	GenHC
Good Nursing Care Scale for Nurses and Patients (GNCS-N/P) – German version Original scale: GNCS-N/P – Finnish version Glarcher (2014)	T	German	7 categories 1. Characteristics of nursing staff 2. Nursing-related activities 3. Environment of care 4. Nursing process 5. Coping strategies of patients 6. Cooperation with relatives 7. Prerequisites of care	54 (2008 version reported)	No validation	-	OnlyNC
Good Nursing Care Scale for Nurses and Patients (GNCS-N/P) – Swedish version Original scale: GNCS-N/P – Finnish version Rehnstrom et al. (2003)	T	Swedish	7 factor solution (based on EFA/PCA) 1. Professional care 2. Care activities and environment 3. Communication 4. Support 5. Physical environment 6. Discharge 7. Respect	71	EFA: orthogonal PCA with varimax rotation, followed by second-order factor analysis 7-factor solution explaining 79% of total variance Reliability measures Test-retest reliability: $r = 0.75$ <u>Internal consistency reliability:</u> Cronbach's α total scale = 0.79; Cronbach's α subscales: 0.32 - 0.95; item-item corr.: 0.15 - 0.91; item-total corr.: > 0.3 for 70 items (Spearman's rank) Validity measures Content validity: assessed by 10 registered nurses Construct validity: see EFA	447	OnlyNC

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 1

Scale (Reference)	Type	Language (Scale)	Factors/Dimensions	Number of items*	Validation methods	Sample size	Focus
Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) scale Giordano et al. (2010)	Des	English	6 composite measures (not based on factor analyses) 1. Communication with nurses 2. Communication with doctors 3. Responsiveness of hospital staff 4. Pain management 5. Communication about medicines 6. Discharge information 2 individual items (global ratings) Overall rating of hospital; willingness to recommend this hospital	18	No validation reported in this paper	-	GenHC
Humane Caring Scale (HCS) Töyry and Vehviläinen-Julkunen (2001)	nD	Finnish	5 domains (derived inductively via essay analysis) with multiple factors (factors based on EFA) 1. Social relations and privacy (3 factors) 2. Personal growth and development (2 factors) 3. Emotional life (3 factors) 4. Physical health (3 factors) 5. Necessary conditions for humane caring (2 factors)	66	EFA: all eigenvalues > 1 1. Domain factor loadings: 0.5 - 0.75, 48% of variance explained 2. Domain: factor loadings: 0.54 - 0.8, 50% of variance explained 3. Domain: factor loadings: 0.5 - 0.81, 56% of variance explained 4. Domain: factor loadings: 0.59 - 0.81, 53% of variance explained 5. Domain: factor loadings: 0.64 - 0.87, 64% of variance explained Reliability measures <u>Internal consistency reliability:</u> Cronbach's $\alpha = 0.92$; Cronbach's α domains: 0.67 - 0.82; Cronbach's α subscales: 0.57 - 0.83 Validity measures Construct validity: inter-item corr.: Pearson's $p > 0.3$ (all other items excluded) Inductive conception of 4 dimensions: Content analysis of essays by patients (n=160), staff (n=193), and political decision makers (n=3) (total number of essays: 265)	758	GenHC
Individualized Care Scale (ICS) Suhonen et al. (2005)	nD	English	3 factors (based on EFA) 1. Clinical situation 2. Personal life situation 3. Decisional control over care 2 versions: Individuality through specific nursing interventions (ICA); individuality in own care (ICB)	38	ICA (ICB in parentheses) PCA/EFA: with promax rotation and Kaiser normalization; 3-factor solution explaining 65% (61%) of total variance; eigenvalues: 9.6 - 0.92 (8.82 - 1.17); factor loadings: 0.57 - 0.9 (0.60 - 0.87) CFA: no goodness-of-fit measures provided Reliability measures Test-retest ICA: Person's product moment corr.: 0.81 - 0.82 Equivalence of ICA and ICB: Pearson's corr. $r = 0.88$ <u>Internal consistency reliability:</u> Cronbach's $\alpha = 0.94$ (0.93); Cronbach's α subscales: 0.88 - 0.89 (0.83 - 0.89); Average inter-item corr.: 0.49 - 0.62 (0.42 - 0.59); corrected item-total corr.: 0.47 - 0.82 (0.35 - 0.8) Pearson's corr. coeffs. were at least 0.88 between the subscales and the total domain ICA or ICB. Validity measures Content validity: CVI > 80% Construct validity: factor analysis and SEM; Pearson's corr. between subscales: 0.88 - 0.93 (0.89 - 0.94)	454	OnlyNC SpecNC

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 1

Scale (Reference)	Type	Language (Scale)	Factors/Dimensions	Number of items*	Validation methods	Sample size	Focus
Inpatient Dignity Scale (IPDS)[‡] Ota et al., 2019	nD	English	4 factors (based on EFA) 1. Respect as a human being 2. Respect for personal feelings and time 3. Respect for privacy 4. Respect for autonomy 2 versions: expectations of; satisfaction with	16 (expectations) 18 (satisfaction)	<i>Expectations (Satisfaction in parentheses)</i> EFA/PCA (Singapore study*): promax rotation 4 -solution explaining 55% (59%) of the total variance; factor loadings: 0.55 – 0.86 (0.54 – 0.88) CFA: confirmed factor-structure from Singapore study Chi-squared/df = 2.32 (2.6); SRMR = 0.06 (0.07); CFI = 0.92 (0.86); RMSEA = 0.09 (0.1) Reliability measures <u>Internal consistency reliability:</u> Cronbach's α = 0.85 (version not specified); Cronbach's α of subscales (Singapore study*): 0.72 – 0.88 (0.72 – 0.90) Validity measures Face validity: expert panel (graduate students and faculty in nursing) Criterion validity: correlation of factors with Rosenberg Self-Esteem- Scale: 0.11 – 0.22 *all other results reported here from England study	165 (test survey, Japan) / 363 (Singapore) / 167 (expectations; England) + 157 (satisfaction; England)	SpecNC
Karen-patient instrument Andersson and Lindgren (2008)	nD	Swedish	No factors, 3 content dimensions 1. Structure quality 2. Process quality 3. Outcome quality	35	Reliability measures <u>Internal consistency reliability:</u> Cronbach's α = 0.86 Validity measures Face validity: 4 items added Discrimination analysis using Likert's method; differences in means for two extreme groups (25% with highest / lowest total scores) for each item: 1.00 – 2.36	64	OnlyNC
La Monica-Oberst Patient Satisfaction Scale (LOPSS) La Monica et al. (1986)	V	English	3 factors (based on EFA) 1. Dissatisfaction 2. Interpersonal support 3. Good impression	42	EFA: principal axes method with iteration, varimax rotation and pairwise deletion; 3-factor-solution explaining 94% of the total variance Reliability measures <u>Internal consistency reliability:</u> Cronbach's α = 0.92 (N = 100) / 0.95 (N = 533); Cronbach's α subscales: 0.89 - 0.92; item-total scale corr.: 0.5 - 0.71 for 34 of 42 items; subscale inter-corr.: 0.58 - 0.74 Validity measures Content validation: assessed by expert panel Discriminant validity: corr. with MAACK between - 0.27 and - 0.2	664 (EFA) / 633 (rel.)	GenNC
Newcastle Satisfaction with Nursing Scale (NSNS) – Turkish version <u>Original scale:</u> NSNS Akin and Erdogan (2007)	T	Turkish	One overall satisfaction score	19	Reliability measures <u>Internal consistency reliability:</u> Cronbach's α = 0.96; item-total corr.: 0.43 - 0.96 Validity measures Content validity: expert panel CVI: 98%	200	OnlyNC
Newcastle Satisfaction with Nursing Scale (NSNS) Thomas et al. (1996)	V	English	2 uni-dimensional scales (based on factor analysis) The Experience of Nursing Care Scale; The Satisfaction with Nursing Care Scale	19 (satisfaction) / 26 (experience)	<i>Experience Scale (Satisfaction Scale in parentheses)</i> Factor analysis: no details provided; 1-factor-solution for each scale Reliability measures <u>Internal consistency reliability:</u> Cronbach's α = 0.91 (0.96); item-total-corr.: 0.31 - 0.69 (0.53 - 0.82) Validity measures Content validity: item generation and selection through representative informants Construct validity: confirmed by examining expected variations related to e.g., age; ability to name nurse correlated with positive experience and higher satisfaction	1,559	OnlyNC

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 1

Scale (Reference)	Type	Language (Scale)	Factors/Dimensions	Number of items*	Validation methods	Sample size	Focus
Patient Evaluation of Emotional Care during Hospitalisation (PEECH) Williams and Kristjanson (2009)	nD	English	4 factors (based on EFA) 1. Level of security 2. Level of knowing 3. Level of personal value 4. Level of connection	22	EFA: principal axis factoring with varimax rotation 4-factor-solution; factor loadings: 0.35 - 0.91 Reliability measures <u>Internal consistency reliability:</u> Cronbach's α subscales: 0.67 - 0.87 Validity measures Content validity: assessed by expert panel	132	GenHC SpecNC
Patient evaluations of the interpersonal care experience (ICE) <u>Original scale:</u> HCAHPS Silvera and Clark (2016)	V	English	1 factor (based on EFA and CFA), including 5 HCHPS measures	13 (in 5 HCHPS measures)	EFA: maximum likelihood estimators to rotate around the number of factors suggested by its scree plot (scree test) Factor loadings: 0.69 - 0.79; eigenvalue of factor: 4.94 CFA: using maximum likelihood Average goodness of fit: 35.93 (no information given about the measure applied) Chi-squared = 0.00; R-Squared: 0.65 - 0.91; factor-solution explained 78% of the total variation Sensitivity Analysis: residual EFA	1178 (EFA) / 18,848 (CFA)	GenHC SpecNC
Patient Experience Questionnaire (PEQ) Pettersen et al. (2004)	nD	Norwegian	10 factors (6 based on EFA; 4 based on theory) 1. Information future complaints 2. Nursing services 3. Communication 4. Information examinations 5. Contact with next-of-kin 6. Doctor services 7. Hospital and equipment 8. Information medication 9. Organization 10. General satisfaction	20	EFA: principal axis factoring with oblique rotation 6-factor-solution explaining 67% of the total variance; Average communality: .55 Reliability measures Test-retest ICC = 0.62 - 0.85 <u>Internal consistency reliability:</u> Cronbach's α subscales: 0.61 - 0.83; corrected item-total-corr.: 0.73 - 0.92 (except: organization: 0.57-0.62) Validity measures Construct validity: general association of summed PEQ scales with external measures; Student's t-test: supports construct validity	19,578	GenHC
Patient Perception of Hospital Experience with Nursing (PPHEN) – 48 item-questionnaire Dozier et al. (2001)	nD	English	Swanson-Kauffman's 5 domains of caring (1988) did not emerge as individual factors One factor (based on EFA)	15	Selection of items with high variance and high item-total corr. in each of the theoretical domains of the previously tested 48-item version. Corr.: 0.59 - 0.75, one exception: 0.8 Inter-item corr.: 0.4 - 0.72 (94% between 0.4 And 0.6) EFA: without rotation; eigenvalue of single factor: 9.58; factor loadings: 0.64 - 0.84 Reliability measures Test-retest reliability: $r = 0.79$ <u>Internal consistency reliability:</u> Cronbach's $\alpha = 0.94$ Validity measures Corr. With SERQUAL $r = 0.64$ ($p < 0.001$) / PSI $r = 0.52$ ($p < 0.01$)	467	OnlyNC

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 1

Scale (Reference)	Type	Language (Scale)	Factors/Dimensions	Number of items*	Validation methods	Sample size	Focus
Patient Satisfaction with Nursing Care Quality Questionnaire (PSNCQQ) Laschinger et al. (2005)	V	English	1 factor (based on EFA and CFA) + 3 additional questions: 1. Satisfaction with overall quality of care during the hospital stay 2. Overall quality of nursing care 3. Intention to recommend the hospital to family and friends	19 + 3	EFA: 1-factor solution; factor loadings: 0.75 - 0.89 CFA: confirmed 1-factor model; Chi-squared = 14.36; GFI = 0.94; IFI = 0.96; CFI = 0.96; RMSEA = 0.91 Reliability measures <u>Internal consistency reliability:</u> Cronbach's α = 0.97; item total corr.: 0.61 - 0.89 Validity measures Predictive validity: ability to predict expected outcomes; Variances explained: 64% (care and services) / 73% (nursing care) / 55% (recommendation intention) Construct validity: see EFA and CFA Sensitivity analysis: dichotomization into two groups by overall satisfaction showed significant difference between PSNCQQ group scores	1041	OnlyNC
Patient's Assessment of Quality Scale – Acute Care Version (PAQS-ACV) Lynn et al. (2007)	nD	English	5 factors (based on EFA) 1. Individualization 2. Nurse characteristics 3. Caring 4. Environment 5. Responsiveness	45	EFA: principal axis factoring with oblique rotation 5 factor-solution explaining 54% of the total variance; factor loadings: 0.42 - 0.78 Reliability measures Test-retest reliability: $r = 0.58 - .71$; factor-to-factor corr.: 0.26 - 0.7 <u>Internal consistency reliability:</u> Cronbach's α subscales: 0.83 - 0.94 (except environment: 0.68) Validity measures Initial content validity: items assessed by 6 patients; Relative importance: determined by 400 patients Construct validity: relationship between PAQS-ACV scores and patients' compliance; significant association ($p < 0.05$)	1470	OnlyNC
Patient-reported experience measure for care in Chinese hospitals (PREM-CCH)[‡] Wang et al., 2021	V	Provided in English; original presumably in Chinese (not explicitly stated)	6 factors (based on EFA) 1. Communication and information 2. Professional competence 3. Medical costs 4. Efficiency 5. Health outcomes 6. Hospital recommendation 2 versions: inpatient and outpatient (outpatient not reported here)	19	EFA/PCA: with varimax rotation Eigenvalues: > 1.0 ; factor loadings: 0.5 – 0.9 Reliability measures <u>Internal consistency reliability:</u> Cronbach's $\alpha = 0.9$; Cronbach's α subscales: 0.7 – 0.8; Corrected item-total-corr.: 0.5 – 0.8; Inter-item-corr.: 0.4 – 0.7 Validity measures Construct validity: Correlation with item on general satisfaction with hospital care Spearman corr. of individual items.: 0.3 – 0.8 all significant; Multivariate linear regression analysis: all factors significant Criterion validity: Correlation between patient experience and satisfaction Spearman corr.: 0.63	1,510	GenHC
Person-Centered Climate Questionnaire-Patient Version (PCQ-P) Edvardsson et al. (2009)	V	English	2 factors (based on PCA) 1. Safety 2. Hospitality	17	PCA: 2-factor solution explaining 65% of the total variance Reliability measures Test-retest reliability: ICC = 0.7 (95% CI 0.63 - 0.77) <u>Internal consistency reliability:</u> Cronbach's $\alpha = 0.9$; Cronbach's α subscales: 0.96 - 0.89; item-total corr.: 0.37 - 0.8 Validity measures Content validity: literature comparison, expert group, consulting with a convenience sample of 5 patients (rating relevance, clarity and readability) Construct validity: see PCA	108	GenHC SpecNC

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 1

Scale (Reference)	Type	Language (Scale)	Factors/Dimensions	Number of items*	Validation methods	Sample size	Focus
Picker Patient Experience Questionnaire (PPE-15) <u>Original scale:</u> Picker-adult inpatient questionnaire Jenkinson (2002)	SF	Multiple languages	8 dimensions (based on face validity) 1. Information and education 2. Coordination of care 3. Physical comfort 4. Emotional support 5. Respect for patient preferences 6. Involvement of family and friends 7. Continuity and transition 8. Overall impression	15	Reliability measures <u>Internal consistency per country:</u> 0.8 - 0.87 (measure not specified) Item-total corr. / Spearman corr.: > 0.3 for all items and countries except one item for Sweden and USA Validity measures Face validity: high face validity, no details provided	2249 (UK) /2663 (Germany) /3274 (Sweden) /7163 (Switzerland) /47,576 (USA)	GenHC
Picker Fitzpatrick et al. (2014)	nD	English	8 domains (based on literature review) + items on patient safety and effectiveness of care 1. Respect for patient-centered values, preferences, and expressed needs 2. Coordination and integration of care 3. Information, communication, and education 4. Physical comfort 5. Emotional support 6. Welcoming the involvement of family and friends 7. Transition and continuity 8. Access to care	12	Only qualitative evaluation of how the different pilot sites implemented the questionnaire	-	GenHC
Problems after Discharge Questionnaire – English version (PADQ-E) <u>Original scale:</u> PADQ – Dutch version Holland et al. (2011)	T	English	8 subscales (based on theoretical model) 1. Information needs 2. Personal care 3. Household activities 4. Mobility 5. Using equipment 6. Following instructions 7. Physical complaints 8. Psychological complaints	47	Reliability measures <u>Internal consistency reliability:</u> Cronbach's α subscales: 0.72 - 0.89 Validity measures Content validity: assessed by convenience sample of discharge planners; S-CI/Ave for subscales: 0.52 - 0.95 Concurrent criterion-related validity: Spearman's rank corr. coeff. with NHP, or CTM-3 (Information needs): 0.25 - 0.75, (exception: Personal care: 0.17)	100	GenHC SpecNC
Quality from the Patient's Perspective (QPP) – refined version <u>Original scale:</u> QPP Larsson et al. (1998)	R	Swedish	Nested model (based on SEM) 1 general factor + 16 subordinate factors 2 versions: Perceived reality; subjective importance	64	<i>Perceived reality (Subjective importance in parentheses)</i> SEM: RMSEA = 0.05; chi-squared = 2534.5 Reliability measures <u>Internal consistency reliability:</u> Cronbach's α subscales: 0.49 - 0.93 (0.53 - 0.93)	611	GenHC
Quality from the Patient's Perspective (QPP) questionnaire – short form <u>Original scale:</u> QPP Wilde Larsson and Larsson (2002)	SF	English	4 dimensions (no factor analysis) 1. Medical–technical competence 2. Physical–technical conditions 3. Identity-oriented approach 4. Socio-cultural atmosphere 2 versions: Perceived reality; subjective importance	20	<i>Perceived reality (Subjective importance in parentheses)</i> Reliability measures <u>Internal consistency reliability:</u> Cronbach's α subscales: 0.67 - 0.91 (0.65 - 0.89) Validity measures Pearson's corr. with long version t-tests for differences in means (compared to long version): 2 (4) of 7 scales with significant differences Chi-square tests for differences in proportion: no significant differences	162	GenHC

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 1

Scale (Reference)	Type	Language (Scale)	Factors/Dimensions	Number of items*	Validation methods	Sample size	Focus
Quality of oncology nursing care scale (QONCS) Charalambous and Adamakidou (2014)	nD	Greek	6 factors (based on EFA) 1. Being supported and confirmed 2. Spiritual caring 3. Sense of belonging 4. Being respected 5. Being valued 6. Communalities	34	EFA: maximum likelihood with oblimin rotation and Kaiser normalization 6-factor solution explaining 69% of the total variance; factor loadings > 0.35 Reliability measures Test-retest reliability (Spearman's corr.): $r = 0.79$ Internal consistency reliability: Cronbach's $\alpha = 0.95$ Validity measures CVR for the 34 items: 0.73 – 1.0 Content validity: assessed by experts; CVI: 0.84	100	OnlyNC
Revised Humane Caring Scale (RHCS) Li Goh et al. (2015)	V	English	5 sub-scales (based on EFA in scale development) 1. Maintenance of social relations and privacy 2. Communication and participation 3. Respecting patients' feelings 4. Maintaining and promoting physical health 5. Ensuring the necessary conditions for humane caring on the ward	46	Reliability measures Inter-rater agreement kappa: 0.94 Corrected item-total corr.: 0.003 - 0.59 (phase III) Internal consistency reliability: Cronbach's α subscales: 0.8 - 0.88 (phase II) / 0.58 - 0.76 (phase III) Validity measures Content validity: assessed by expert panel (phase I); CVI: 0.86 – 1	20 (p. I) / 20 (p. II) / 235 (p. III)	GenHC
Sri Lankan setting: Patient perception of the quality of nursing care and related health services[±] Senarath and Gunawardena, 2011	nD	English	8 factors (based on EFA/PCA) 1. Interpersonal care 2. Efficiency 3. Comfort 4. Sanitation 5. Personalized information 6. Physical environment 7. General instructions 8. Competency	36	EFA/PCA: with varimax rotation 8-factor-solution explaining 71% of the total variance; Eigenvalues: 1.09 – 10.44; factor loadings > 0.59; Reliability measures Item-total-corr. > .2 Inter scale corr.: positive but weak Internal consistency reliability: Cronbach's $\alpha = .91$; Cronbach's α subscales: > .75 (except 2 subscales: .53 (7) and .37 (8)) Validity measures Construct validity: see EFA/PCA	120	OnlyNC
Trust in Nurses Scale Radwin and Cabral (2010)	V	Not reported	Uni-dimensional	4-5	5-item solution (4-item solution in parentheses) EFA/PCA: with varimax rotation Factor-solution explaining 59% (66%) of the total variance; Standardized factor loadings: 0.5 - 0.64 (0.63 - 0.85) CFA: CFI = 0.99 (1.0); TLI = 0.98 (1.0); SRMR = 0.02 (.02); RMSEA = 0.07 (<0.001) Reliability measures Internal consistency reliability: Cronbach's $\alpha = 0.77$ (0.82) Validity measures Construct validity: see CFA; content, item-convergent, discriminant validity and test-retest reliability previously reported (Radwin et al. 2005)	187	OnlyNC SpecNC

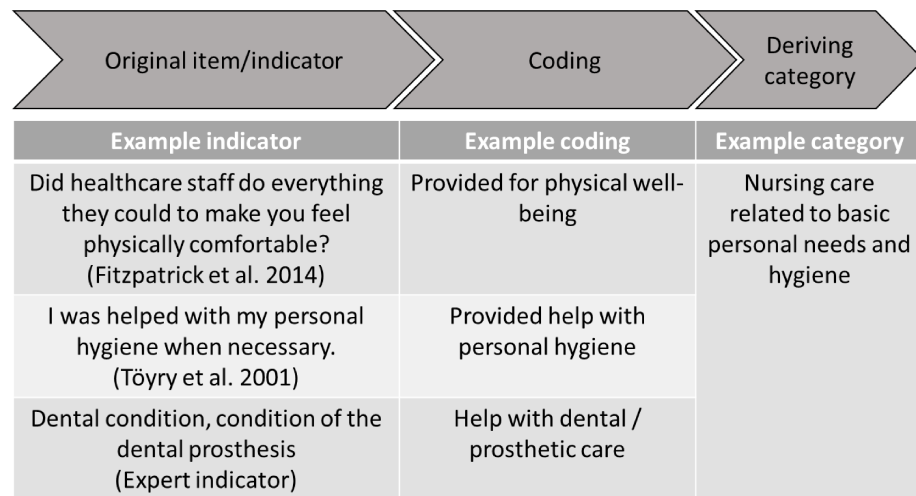
Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 1

Scale (Reference)	Type	Language (Scale)	Factors/Dimensions	Number of items*	Validation methods	Sample size	Focus
Watson Caritas Patient Score (WCPS) [‡] Brewer and Watson, 2015	V	English	Uni-dimensional	5	EFA/PCA: with varimax rotation 1-factor solution explaining 76% of the total variance; factor loadings > 0.76 Internal consistency reliability: Cronbach's $\alpha = .90$ Validity measures Construct validity: see EFA; Each item correlated with the HCAHPS scores Correlation with HCAHPS "communication with nursing staff": $p > 0.32$ (significant for 3 items) Correlation with HCAHPS "responsiveness of hospital staff": $p = 0.33$ (significant for 1 item) Unit score: Shortell's criteria ($F > 1.4, P < .05$) for aggregation of individual items to reflect a group was met	1010	OnlyNC

*without items on demographics; ‡result of the updated literature search in July 2023, items have not been included in PENQuAH scale construction process

C = CINAHL; CFA = confirmatory factor analyses; CFI = comparative fit index; CVI = content validity index; CVR = content validity ratio; Des = description of new scale; EFA = exploratory factor analyses; EN = expert network; GenHC = scale focuses on healthcare quality in general; GFI = goodness-of-fit index; IFI = incremental fit index; nD = development of new scale; OnlyNC = scale focuses on nursing care quality only; R = refinement; RM = reference mining; RMSE = root mean square error; RMSEA = root mean square error of approximation; S-CI/Ave = scale content validity index; SEM = structural equation modelling; SF = short form; SpecNC = scale assesses only specific aspects of nursing care; SRMR = standardized root mean square residual; T = translation; TLI = Tucker-Lewis index; V = validation; WRMR = weighted root mean square residual.

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 1

Figure 1: Coding process illustrated by an example category

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 1

Table 2: Characteristics of participants in cognitive pre-testing

Characteristic	Allocation in the sample (N=9)
Gender	Male participants: n=4 Female participants: n=5
Age	Mean: 59.9 years Range: 18-93 years
Occupation	Merchant (retired): n=2 Salespersons (retired): n=1 University administrator: n=1 Researcher in healthcare science and physiotherapist: n=1 High school teacher (retired): n=1 College student: n=1 Clerical employee (retired): n=1 Insurance company employee: n=1
Highest level of educational attainment	Middle school: n=1 High school: n=3 University degree: n=5 (two business graduates, one social science, one teaching profession studies and one healthcare sciences graduate)
Number of previous hospitalizations	One: n=2 More than one: n=7
Time since last hospital stay	Mean: 2.7 years Range: less than one year to 6 years
Special characteristics	One native speaker of Albanian and one physically impaired participant with chronic care needs

Please note: in order to preserve the anonymity of the participants, we report their characteristics only in aggregated form.

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 1

Table 3: Items modified based on cognitive pretesting

Modifications	Description	Quantity
Major (question)	Redrafted due to incomprehensibility of concepts and inconsistent understanding of the question	2
Minor (question)	Changed the order of words or replaced phrases with synonyms due to incomprehensibility; the original meaning of the item was retained	24
Major (response options)	Extended the response scale by one or more options (e.g., 6 instead of 3)	21
Minor (response options)	Kept the scale but changed the wording (e.g., "yes, absolutely" to "fully")	6
Deletion	Deleted the question because it was incomprehensible or inconsistently understood	4

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 1

Table 4: Characteristics and representativity of survey participants

Patient characteristics*	Patient Survey	Hospital patients, total German population 2019 (Statistisches Bundesamt)
Age**		
18-29	4.0%	8.4%
30-44	8.8%	13.2%
45-59	29.1%	19.7%
60-74	38.5%	26.0%
≥ 75	19.5%	32.7%
Gender**		
Male	60.9%	48.0%
Female	39.1%	52.0%
State**		
Baden-Württemberg	11.4%	11.3%
Bavaria	12.0%	15.6%
Berlin	4.0%	4.6%
Brandenburg	2.4%	2.9%
Bremen	0.9%	1.0%
Hamburg	5.2%	2.6%
Hessen	9.3%	7.1%
Lower Saxony	9.0%	8.8%
Mecklenburg-Vorpommern	1.2%	2.1%
North Rhine-Westphalia	29.2%	23.7%
Rhineland-Palatinate	5.2%	4.9%
Saarland	1.3%	1.5%
Saxony	2.7%	5.0%
Saxony-Anhalt	1.6%	2.9%
Schleswig-Holstein	3.4%	3.1%
Thuringia	1.3%	3.0%
Nationality		
German	97.0%	-
German and other	0.4%	-
Non-German	2.7%	-
Difficulties prior to hospital stay (due to physical/mental illness)		
Difficulties in those activities of daily living	25.4%	-
Difficulties at work or my studies/training/education	11.0%	-
Difficulties accessing buildings, roads or vehicles	9.2%	-
Difficulties with reading or writing	3.0%	-
Difficulties in communicating, contacting or being together with other people	3.8%	-
Difficulties in other activities or situations	9.1%	-
No difficulties with such matters	67.4%	-
Difficulties since hospital stay		
Patient needs more help with meals	9.6%	-
Patient needs more help to do shopping	20.9%	-
Patient needs more help in the home	25.4%	-
Patient needs more help with financial matters	6.5%	-
Patient needs more help with personal hygiene	12.0%	-

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 1

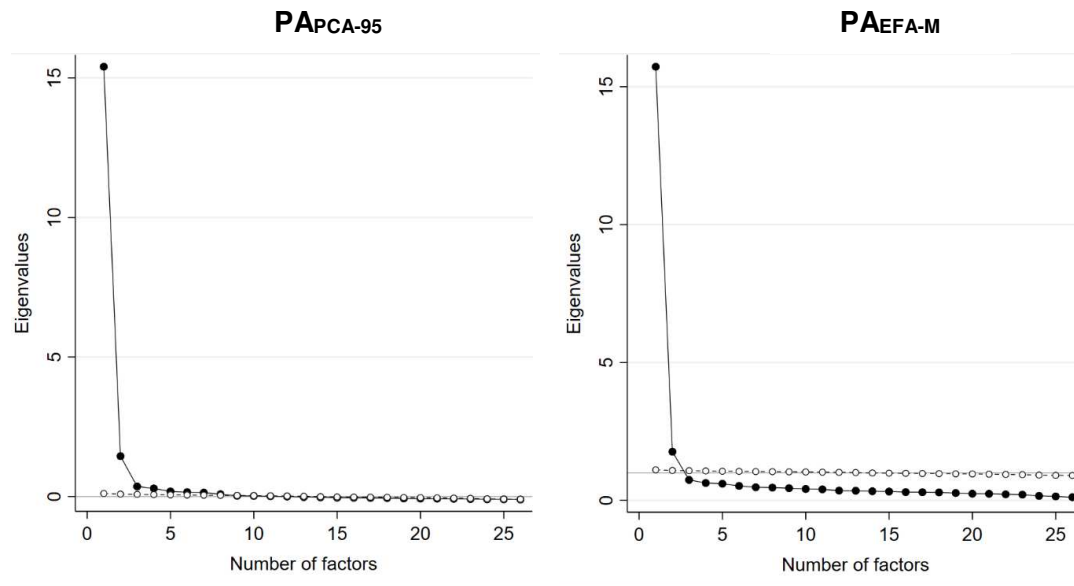
Patient characteristics*	Patient Survey	Hospital patients, total German population 2019 (Statistisches Bundesamt)
Highest level of educational attainment		
Student at school	0.2%	-
Left school without a school-leaving certificate	0.5%	-
Lower secondary education certificate or equivalent	17.2%	-
Secondary school 10th grade certificate or equivalent	24.7%	-
Graduated from a technical secondary school	17.3%	-
General or subject-specific qualification for university	34.1%	-
Other school leaving certificate	6.1%	-
Degrees or other academic or vocational qualifications		
None	2.6%	-
Currently still at school/college/doing an apprenticeship	1.8%	-
On-the-job vocational training (apprenticeship)	43.7%	-
Vocational qualification certificate	30.4%	-
Bachelor's degree	4.3%	-
Master's degree or equivalent	30.5%	-
Doctoral degree/PhD	3.7%	-
Other	9.1%	-
Employment situation		
Full-time employment	31.7%	-
Part-time employment	9.4%	-
Marginally employed, 400 euro job, mini-job	2.5%	-
(Partially) retired or unemployed	51.8%	-
Freelancer	3.1%	-
Other (e.g. parental leave or irregular employment)	1.5%	-
Average monthly net household income		
Under 450 euros	1.1%	-
Up to 1000 euros	3.3%	-
Up to 1500 euros	7.3%	-
Up to 2000 euros	13.4%	-
Up to 3000 euros	30.0%	-
Up to 4000 euros	21.1%	-
Up to 6000 euros	17.7%	-
Up to 10,000 euros	5.4%	-
Over 10,000 euros	0.7%	-

* Shortened item texts. See Supplementary file 2 for more details.

** Based on claims data provided by the statutory health insurer that have been combined with the survey sample; refers to the full survey sample (n=27,880) while the remaining descriptives refer to the sub-sample (n=17,859) that was used to validate PENQuAH.

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 1

Figure 2: Parallel Analysis



Note: We used average EFA eigenvalues (PA_{EFA-M}) and the 95th percentiles of PCA eigenvalues (PA_{PCA-95}) as reference values. The solid circles represent the sorted eigenvalues of the observed sample correlation matrix. The empty circles represent the reference eigenvalues from 100 randomly generated independent samples.

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 1

Table 5. Goodness-of-overall-fit Indices for all factor solutions suggested by EFA and for the proposed second order model

Fit statistic <i>[rule according to Hu & Bentler 1999]</i>	Model according to EFA factor solutions; after exclusion of Items 30-32					Proposed second order model
	2- and 3- factor extraction	4-factor extraction	6-factor extraction	7-factor extraction	8-factor extraction	
SRMR <i>[should be close to 0.08 or below]</i>	0.028	0.024	0.023	0.015	0.018	0.022
RMSEA <i>[should be close to 0.06 or below]</i>	0.076	0.061	0.057	0.061	0.067	0.055
CFI <i>[should be close to 0.95 or greater]</i>	0.980	0.987	0.991	0.996	0.994	0.990
TLI <i>[should be close to 0.95 or greater]</i>	0.978	0.986	0.989	0.994	0.991	0.988

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 1

References

- Acosta, A. M., Lima, M., Marques, G. Q., Levandovski, P. F. and Weber, L. (2017) 'Brazilian version of the Care Transitions Measure: translation and validation', *International Nursing Review*, vol. 64, no. 3, pp. 379–387.
- Akin, S. and Erdogan, S. (2007) 'The Turkish version of the Newcastle Satisfaction with Nursing Care Scale used on medical and surgical patients', *Journal of clinical nursing*, vol. 16, no. 4, pp. 646–653.
- Andersson, I. S. and Lindgren, M. (2008) 'The Karen Instruments for Measuring Quality of Nursing Care. Item Analysis', *Nordic Journal of Nursing Research*, vol. 28, no. 3, pp. 14–18.
- Brewer, B. B. and Watson, J. (2015) 'Evaluation of Authentic Human Caring Professional Practices', *The Journal of nursing administration*, vol. 45, no. 12, pp. 622–627.
- Charalambous, A. and Adamakidou, T. (2014) 'Construction and validation of the quality of oncology nursing care scale (QONCS)', *BMC nursing*, vol. 13, no. 1, p. 48.
- Coleman, E. A., Mahoney, E. and Parry, C. (2005) 'Assessing the quality of preparation for posthospital care from the patient's perspective: the care transitions measure', *Medical care*, vol. 43, no. 3, pp. 246–255.
- Columbe, K. H., Yeakel, S., Maljanian, R. and Bohannon, R. W. (2002) 'Caring Behaviors Inventory: Analysis of Responses by Hospitalized Surgical Patients', *Outcomes Management*, vol. 6, no. 3, pp. 138–141.
- Dozier, A. M., Kitzman, H. J., Ingersoll, G. L., Holmberg, S. and Schultz, A. W. (2001) 'Development of an instrument to measure patient perception of the quality of nursing care', *Research in nursing & health*, vol. 24, no. 6, pp. 506–517.
- Edvardsson, D., Koch, S. and Nay, R. (2009) 'Psychometric Evaluation of the English Language Person-Centered Climate Questionnaire—Patient Version', *Western Journal of Nursing Research*, vol. 31, no. 2, pp. 235–244.
- Edvardsson, D., Mahoney, A.-M., Hardy, J., McGillion, T., McLean, A., Pearce, F., Salamone, K. and Watt, E. (2015) 'Psychometric performance of the English language six-item Caring Behaviours Inventory in an acute care context', *Journal of clinical nursing*, vol. 24, 17–18, pp. 2538–2544.
- Fitzpatrick et al. (2014) *Development of New Models for Collection and Use of Patient Experience Information in the NHS – PRP 070/0074: Final Report*, Oxford, Picker Institute Europe.
- Giordano, L. A., Elliott, M. N., Goldstein, E., Lehrman, W. G. and Spencer, P. A. (2010) 'Development, implementation, and public reporting of the HCAHPS survey', *Medical care research and review : MCCR*, vol. 67, no. 1, pp. 27–37.
- Glarcher, M. (2014) 'Kulturelles und sprachliches Übersetzungsverfahren eines Fragebogens am Beispiel der Good Nursing Care Scale (GNCS)', *Pflegewissenschaft*, vol. 16, no. 11, pp. 612–620.
- Holland, D. E., Mistiaen, P., Knafel, G. J. and Bowles, K. H. (2011) 'The English Translation and Testing of the Problems after Discharge Questionnaire', *Social Work Research*, vol. 35, no. 2, pp. 107–116.
- Jenkinson, C. (2002) 'The Picker Patient Experience Questionnaire: development and validation using data from in-patient surveys in five countries', *International Journal for Quality in Health Care*, vol. 14, no. 5, pp. 353–358.

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 1

- La Monica, E. L., Oberst, M. T., Madea, A. R. and Wolf, R. M. (1986) 'Development of a patient satisfaction scale', *Research in nursing & health*, vol. 9, no. 1, pp. 43–50.
- Labarere, J., Francois, P., Auquier, P., Robert, C. and Fourny, M. (2001) 'Development of a French inpatient satisfaction questionnaire', *International Journal for Quality in Health Care*, vol. 13, no. 2, pp. 99–108.
- Labarère, J., Fourny, M., Jean-Phillippe, V., Marin-Pache, S. and Patrice, F. (2004) 'Refinement and validation of a French in-patient experience questionnaire', *International journal of health care quality assurance incorporating Leadership in health services*, vol. 17, no. 1, pp. 17–25 [Online]. DOI: 10.1108/09526860410515909.
- Larsson, G., Wilde Larsson, B. and Munck, I. M. E. (1998) 'Refinement of the Questionnaire 'Quality of Care from the Patient's Perspective' using Structural Equation Modelling', *Scandinavian Journal of Caring Sciences*, vol. 12, no. 2, pp. 111–118.
- Laschinger, H. S., Hall, L. M., Pedersen, C. and Almost, J. (2005) 'A psychometric analysis of the patient satisfaction with nursing care quality questionnaire: an actionable approach to measuring patient satisfaction', *Journal of nursing care quality*, vol. 20, no. 3, pp. 220–230.
- Li Goh, M., Ang, E. N. K., Chan, Y.-H., He, H.-G. and Vehviläinen-Julkunen, K. (2015) 'Psychometric testing of the Revised Humane Caring Scale for adult patients in Singapore', *Nursing & health sciences*, vol. 17, no. 3, pp. 370–376.
- Liu, B., Liu, S., Zheng, T., Wang, Y., Cao, B., Wang, Z., Yu, L., Zhang, N., Zhao, B., Lu, D., Chen, L., Ma, T., Zhong, Y. and He, S. (2021) 'Development and validation of the Chinese surgical inpatient satisfaction and comfort questionnaire', *Medicine*, vol. 100, no. 52, e28363.
- Lynn, M. R., McMillen, B. J. and Sidani, S. (2007) 'Understanding and measuring patients' assessment of the quality of nursing care', *Nursing research*, vol. 56, no. 3, pp. 159–166.
- Ota, K., Maeda, J., Gallagher, A., Yahiro, M., Niimi, Y., Chan, M. F. and Matsuda, M. (2019) 'Development of the Inpatient Dignity Scale Through Studies in Japan, Singapore, and the United Kingdom', *Asian nursing research*, vol. 13, no. 1, pp. 76–85.
- Pettersen, K. I., Veenstra, M., Guldvog, B. and Kolstad, A. (2004) 'The Patient Experiences Questionnaire: development, validity and reliability', *International Journal for Quality in Health Care*, vol. 16, no. 6, pp. 453–463.
- Radwin, L. E. and Cabral, H. J. (2010) 'Trust in Nurses Scale: construct validity and internal reliability evaluation', *Journal of Advanced Nursing*, vol. 66, no. 3, pp. 683–689.
- Rehnstrom, L., Christensson, L., Leino-Kilpi, H. and Unosson, M. (2003) 'Adaptation and psychometric evaluation of the Swedish version of the Good Nursing Care Scale for Patients', *Scandinavian Journal of Caring Sciences*, vol. 17, no. 3, pp. 308–314.
- Senarath, U. and Gunawardena, N. S. (2011) 'Development of an instrument to measure patient perception of the quality of nursing care and related hospital services at the national hospital of sri lanka', *Asian nursing research*, vol. 5, no. 2, pp. 71–80.
- Silvera, G. A. and Clark, J. R. (2016) 'Patient evaluations of the interpersonal care experience (ICE) in U.S. hospitals: A factor analysis of the HCAHPS survey', *Patient Experience Journal*, vol. 3, no. 1, pp. 101–109.
- Statistisches Bundesamt *Diagnosedaten der Krankenhäuser ab 2000 (Eckdaten der vollstationären Patienten und Patientinnen)* [Online]. Available at www.gbe-bund.de (Accessed 5 July 2023).

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 1

Suhonen, R., Leino-Kilpi, H. and Valimaki, M. (2005) 'Development and psychometric properties of the Individualized Care Scale', *Journal of Evaluation in Clinical Practice*, vol. 11, no. 1, pp. 7–20.

Thomas, L. H., McColl, E., Priest, J., Bond, S. and Boys, R. J. (1996) 'Newcastle satisfaction with nursing scales: an instrument for quality assessments of nursing care', *Quality and Safety in Health Care*, vol. 5, no. 2, pp. 67–72 [Online]. DOI: 10.1136/qshc.5.2.67 (Accessed 15 June 2018).

Töyry, E. and Vehviläinen-Julkunen, K. (2001) "Developing an Instrument for the Measurement of Humane Caring", *Nordic Journal of Nursing Research*, vol. 21, no. 1, pp. 20–24.

Wang, X., Chen, J., Yang, Y., Burström, B. and Burström, K. (2021) 'Validation of the patient-reported experience measure for care in Chinese hospitals (PREM-CCH)', *International journal for equity in health*, vol. 20, no. 1, p. 25.

Wilde Larsson, B. and Larsson, G. (2002) 'Development of a short form of the Quality from the Patient's Perspective (QPP) questionnaire', *Journal of Clinical Nursing*, vol. 11, no. 5, pp. 681–687.

Williams, A. M. and Kristjanson, L. J. (2009) 'Emotional care experienced by hospitalised patients: development and testing of a measurement instrument', *Journal of Clinical Nursing*, vol. 18, no. 7, pp. 1069–1077.

Wolf, Z. R., Giardino, E. R., Osborne, P. A. and Ambrose, M. S. (1994) 'Dimensions of Nurse Caring', *The Journal of Nursing Scholarship*, vol. 6, no. 2, pp. 107–112.

Wu, Y., Larrabee, J. H. and Putman, H. P. (2006) 'Caring Behaviors Inventory: a reduction of the 42-item instrument', *Nursing research*, vol. 55, no. 1, pp. 18–25.

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 2

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH): Questionnaire (English translation; original German version below)

Introduction statement: We would like you to use this questionnaire to evaluate your most recent hospital stay. Please read the statements and questions and tick the answer that fits best for you. If someone else helps you fill out the questionnaire, please remember that the answers should be given from your own point of view and not from the point of view of the other person! Only one answer is possible for each statement or question, unless stated otherwise.

1)	It was very easy for me to get the required care as and when I needed it.	<input type="checkbox"/> Absolutely correct <input type="checkbox"/> More or less correct <input type="checkbox"/> Partly correct <input type="checkbox"/> Not quite correct <input type="checkbox"/> Absolutely wrong
2)	The nursing staff always responded as quickly as possible to my call bell.	<input type="checkbox"/> Absolutely correct <input type="checkbox"/> More or less correct <input type="checkbox"/> Partly correct <input type="checkbox"/> Not quite correct <input type="checkbox"/> Absolutely wrong <input type="checkbox"/> I never used the call light
3)	The nursing staff always responded to my personal needs.	<input type="checkbox"/> Absolutely correct <input type="checkbox"/> More or less correct <input type="checkbox"/> Partly correct <input type="checkbox"/> Not quite correct <input type="checkbox"/> Absolutely wrong
4)	The nursing staff asked me about pain in an adequate way and treated me accordingly.	<input type="checkbox"/> Absolutely correct <input type="checkbox"/> More or less correct <input type="checkbox"/> Partly correct <input type="checkbox"/> Not quite correct <input type="checkbox"/> Absolutely wrong <input type="checkbox"/> I had no pain
5)	The nursing staff told me or showed me what I could do myself to relieve my pain.	<input type="checkbox"/> Absolutely correct <input type="checkbox"/> More or less correct <input type="checkbox"/> Partly correct <input type="checkbox"/> Not quite correct <input type="checkbox"/> Absolutely wrong <input type="checkbox"/> I had no pain
6)	The nursing staff always took the best possible care of my physical well-being.	<input type="checkbox"/> Absolutely correct <input type="checkbox"/> More or less correct <input type="checkbox"/> Partly correct <input type="checkbox"/> Not quite correct <input type="checkbox"/> Absolutely wrong

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 2

7)	The nursing staff provided me with understandable information.	<input type="checkbox"/> Absolutely correct <input type="checkbox"/> More or less correct <input type="checkbox"/> Partly correct <input type="checkbox"/> Not quite correct <input type="checkbox"/> Absolutely wrong
8)	The nursing staff always treated me sympathetically.	<input type="checkbox"/> Absolutely correct <input type="checkbox"/> More or less correct <input type="checkbox"/> Partly correct <input type="checkbox"/> Not quite correct <input type="checkbox"/> Absolutely wrong
9)	The nursing staff treated me politely and with respect.	<input type="checkbox"/> Absolutely correct <input type="checkbox"/> More or less correct <input type="checkbox"/> Partly correct <input type="checkbox"/> Not quite correct <input type="checkbox"/> Absolutely wrong
10)	Overall, the nursing staff always kept me adequately informed about procedures and next steps in my treatment.	<input type="checkbox"/> Absolutely correct <input type="checkbox"/> More or less correct <input type="checkbox"/> Partly correct <input type="checkbox"/> Not quite correct <input type="checkbox"/> Absolutely wrong
11)	I always had the feeling that I could talk to the nursing staff about my fears and worries.	<input type="checkbox"/> Absolutely correct <input type="checkbox"/> More or less correct <input type="checkbox"/> Partly correct <input type="checkbox"/> Not quite correct <input type="checkbox"/> Absolutely wrong
12)	The nursing staff took sufficient time for my care.	<input type="checkbox"/> Absolutely correct <input type="checkbox"/> More or less correct <input type="checkbox"/> Partly correct <input type="checkbox"/> Not quite correct <input type="checkbox"/> Absolutely wrong
13)	I had the impression that the nursing staff worked well as a team in order to provide the best possible care and treatment.	<input type="checkbox"/> Absolutely correct <input type="checkbox"/> More or less correct <input type="checkbox"/> Partly correct <input type="checkbox"/> Not quite correct <input type="checkbox"/> Absolutely wrong
14)	Others (e.g., relatives) had to take on nursing tasks in my case because these tasks were not fulfilled by the nursing staff.	<input type="checkbox"/> Yes, frequently <input type="checkbox"/> Yes, occasionally <input type="checkbox"/> Yes, rarely <input type="checkbox"/> No, never
15)	The nursing staff told or showed me what I had to do in terms of eating/drinking and personal care/hygiene.	<input type="checkbox"/> Absolutely correct <input type="checkbox"/> More or less correct <input type="checkbox"/> Partly correct <input type="checkbox"/> Not quite correct <input type="checkbox"/> Absolutely wrong

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 2

16)	The nursing staff told or showed me how I could move and also how I should move.	<input type="checkbox"/> Absolutely correct <input type="checkbox"/> More or less correct <input type="checkbox"/> Partly correct <input type="checkbox"/> Not quite correct <input type="checkbox"/> Absolutely wrong
17)	The nursing staff told or showed me what I was allowed to do physically and also what I should do.	<input type="checkbox"/> Absolutely correct <input type="checkbox"/> More or less correct <input type="checkbox"/> Partly correct <input type="checkbox"/> Not quite correct <input type="checkbox"/> Absolutely wrong
18)	The nursing staff explained the purpose of my medication to me and told or showed me how it should be taken.	<input type="checkbox"/> Absolutely correct <input type="checkbox"/> More or less correct <input type="checkbox"/> Partly correct <input type="checkbox"/> Not quite correct <input type="checkbox"/> Absolutely wrong <input type="checkbox"/> Was not necessary
19)	The nursing staff told me whether I needed any medical supplies (e.g., bandages, pads) or devices for use at home and, if so, which ones and how I could get them.	<input type="checkbox"/> Absolutely correct <input type="checkbox"/> More or less correct <input type="checkbox"/> Partly correct <input type="checkbox"/> Not quite correct <input type="checkbox"/> Absolutely wrong <input type="checkbox"/> Was not necessary
20)	The nursing staff told or showed me how to use the medical supplies or devices.	<input type="checkbox"/> Absolutely correct <input type="checkbox"/> More or less correct <input type="checkbox"/> Partly correct <input type="checkbox"/> Not quite correct <input type="checkbox"/> Absolutely wrong <input type="checkbox"/> Was not necessary
21)	The nursing staff provided me with support when I was discharged from the hospital.	<input type="checkbox"/> Absolutely correct <input type="checkbox"/> More or less correct <input type="checkbox"/> Partly correct <input type="checkbox"/> Not quite correct <input type="checkbox"/> Absolutely wrong
22)	The nursing staff helped me take care of my own health.	<input type="checkbox"/> Absolutely correct <input type="checkbox"/> More or less correct <input type="checkbox"/> Partly correct <input type="checkbox"/> Not quite correct <input type="checkbox"/> Absolutely wrong
23)	Regarding the time after discharge from the hospital: the nursing staff told me when I should see a doctor.	<input type="checkbox"/> Absolutely correct <input type="checkbox"/> More or less correct <input type="checkbox"/> Partly correct <input type="checkbox"/> Not quite correct <input type="checkbox"/> Absolutely wrong

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 2

24)	Since your stay in the hospital, do you need more help with meals (e.g., someone who cooks for you, or Meals on Wheels)?	<input type="checkbox"/> Yes, much more than before <input type="checkbox"/> Yes, a bit more than before <input type="checkbox"/> No
25)	Since your stay in hospital, do you need more help to do shopping (from family/friends or paid service providers)?	<input type="checkbox"/> Yes, much more than before <input type="checkbox"/> Yes, a bit more than before <input type="checkbox"/> No
26)	Since your stay in hospital, do you need more help in the home (from family/friends or paid service providers)?	<input type="checkbox"/> Yes, much more than before <input type="checkbox"/> Yes, a bit more than before <input type="checkbox"/> No
27)	Since your stay in hospital, do you need more help with your financial matters (from family/friends or carer/ guardian)?	<input type="checkbox"/> Yes, much more than before <input type="checkbox"/> Yes, a bit more than before <input type="checkbox"/> No
28)	Since your stay in hospital, do you need more help with personal hygiene (from family/friends or outpatient care service)?	<input type="checkbox"/> Yes, much more than before <input type="checkbox"/> Yes, a bit more than before <input type="checkbox"/> No
29)	When you were in hospital, did you fall, slip or slide in such a way that you ended up lying or sitting on the ground?	<input type="checkbox"/> Yes, several times <input type="checkbox"/> Yes, once <input type="checkbox"/> No
30)	After my hospital stay, my level of trust in the nursing staff can be described as:	<input type="checkbox"/> More trust <input type="checkbox"/> Unchanged high level of trust <input type="checkbox"/> Unchanged low level of trust <input type="checkbox"/> Less trust
31)	Thinking about the nursing staff, would you recommend this hospital to your family and friends?	<input type="checkbox"/> Yes, definitely <input type="checkbox"/> Yes, probably <input type="checkbox"/> No, probably not <input type="checkbox"/> No, not at all
32)	Thinking about the nursing staff, would you choose the same hospital again next time?	<input type="checkbox"/> Yes, definitely <input type="checkbox"/> Yes, probably <input type="checkbox"/> No, probably not <input type="checkbox"/> No, not at all

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 2

33)	Is there anything else you consider important about the quality of nursing care you received but which is not taken into account in this questionnaire?	(with character limit and character counter)
-----	---	--

Your personal details

P1) Who filled out this questionnaire?	<input type="checkbox"/> I am/was the patient and I filled it out myself <input type="checkbox"/> A relative <input type="checkbox"/> I am/was the patient and I filled it out together with a relative <input type="checkbox"/> I am/was the patient and I filled it out together with a member of the nursing staff
<i>Please remember: All of the questions should be answered from the point of view of the person to whom the questionnaire was addressed. This also applies to the following personal details.</i>	
P2) Please tick all the boxes that apply to you: Before my hospital stay, I already had a physical or mental illness and experienced ...	<input type="checkbox"/> ... difficulties in those activities of daily living that a person of my age is normally able to cope with <input type="checkbox"/> ... difficulties at work or my studies/training/education <input type="checkbox"/> ... difficulties accessing buildings, roads or vehicles <input type="checkbox"/> ... difficulties with reading or writing <input type="checkbox"/> ... difficulties with how other people behaved towards me because of my illness <input type="checkbox"/> ... difficulties in communicating, contacting or being together with other people <input type="checkbox"/> ... difficulties in other activities or situations: _____ <input type="checkbox"/> ... no difficulties with such matters
P3) What nationality(ies) do you have?	(Please specify)
P4) Are you currently married or in a partnership with a person in your household?	<input type="checkbox"/> Yes <input type="checkbox"/> No
P5) What is your highest level of educational attainment?	<input type="checkbox"/> Student at school <input type="checkbox"/> Left school without a school-leaving certificate <input type="checkbox"/> Lower secondary education certificate ("Hauptschulabschluss") / primary education certificate ("Volksschulabschluss") or Polytechnic High School of the

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 2

	<p>GDR with graduation in 8th/9th grade</p> <ul style="list-style-type: none"> <input type="checkbox"/> Secondary school 10th grade certificate (GCSE) or Polytechnic High School of the GDR with graduation in 10th grade <input type="checkbox"/> Graduated from a technical secondary school (“Fachhochschulreife, Abschluss einer Fachoberschule”) <input type="checkbox"/> General or subject-specific qualification for university (A-levels/“Abitur”) (“Gymnasium” or Extended Secondary School of the GDR with apprenticeship) <input type="checkbox"/> Other school leaving certificate: _____
<p>P6) Which degrees or other academic or vocational qualifications do you have?</p>	<p><i>(Multiple answers possible)</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> Currently still at school or college or doing an apprenticeship <input type="checkbox"/> None <input type="checkbox"/> On-the-job vocational training (apprenticeship) <input type="checkbox"/> Vocational qualification certificate ** <input type="checkbox"/> Bachelor’s degree <input type="checkbox"/> “Diploma”, master’s degree, “Magister” or state examination <input type="checkbox"/> Doctoral degree/PhD <input type="checkbox"/> Other: _____ <p>**Including:</p> <ul style="list-style-type: none"> • A vocational qualification certificate gained from a vocational school or college • In preparation for the intermediate civil service in public administration • Completion of a one-year training course at a healthcare school • Completion of a two- to three-year training course at a healthcare school • Completion of training as a nursery school teacher/educator • Graduation from a technical school of the GDR

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 2

	<ul style="list-style-type: none"> • Graduation from a technical school, master craftsman's school, administration and business academy or technical academy
<p>P7) What is your employment situation? Please note that an employment situation means any paid work/any income-related activity.</p>	<p><i>(Only one entry possible!)</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> Full-time employment <input type="checkbox"/> Part-time employment <input type="checkbox"/> Partial retirement (regardless of whether you are in the work phase or release phase) <input type="checkbox"/> Marginally employed, 400 euro job, mini-job <input type="checkbox"/> One-Euro-Job (when receiving Unemployment Benefit II) <input type="checkbox"/> Occasionally or irregularly employed <input type="checkbox"/> Vocational training/ apprenticeship <input type="checkbox"/> Retraining <input type="checkbox"/> Voluntary military service <input type="checkbox"/> Federal voluntary service or voluntary social year <input type="checkbox"/> Maternity leave, parental leave or other leave of absence <input type="checkbox"/> Unemployed (including: pensioners with no additional income, early retirees, pupils or students who do not work for money)
<p>P8) How many people live permanently in your household, including yourself? <i>A household includes all persons who live and work together. Please also include all children living in the household.</i></p>	<p>Please specify: ____</p>
<p>P9) What is the average monthly net income of your household in total? <i>Please be assured that the information you provide will not be evaluated in any way that could personally identify you. The average monthly net income of your household is the sum resulting from wages, salaries, income from self-employment, and pensions. Please also include income from state benefits, income from renting and leasing property, assets, housing allowance, child benefits and other income and then deduct taxes and social insurance contributions.</i></p>	<ul style="list-style-type: none"> <input type="checkbox"/> Under 450 euros <input type="checkbox"/> Up to 1000 euros <input type="checkbox"/> Up to 1500 euros <input type="checkbox"/> Up to 2000 euros <input type="checkbox"/> Up to 3000 euros <input type="checkbox"/> Up to 4000 euros <input type="checkbox"/> Up to 6000 euros <input type="checkbox"/> Up to 10,000 euros <input type="checkbox"/> Over 10,000 euros

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 2

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH): Questionnaire (German original version)

In diesem Fragebogen sollen Sie Ihren letzten Krankenhausaufenthalt bewerten. Bitte lesen Sie die Aussagen bzw. Fragen durch und kreuzen die Antwort an, die für Sie am besten passt. Falls eine andere Person Ihnen beim Ausfüllen hilft, sollte der Bogen trotzdem aus Ihrer Sichtweise beantwortet werden und nicht aus der Sicht der anderen Person! Wenn nicht anders angegeben, ist nur eine Antwort möglich.

1) Es war für mich sehr leicht, die benötigte Pflege zu bekommen, als ich sie gebraucht habe.	<input type="checkbox"/> Stimmt voll und ganz <input type="checkbox"/> Stimmt eher <input type="checkbox"/> Teils/teils <input type="checkbox"/> Stimmt eher nicht <input type="checkbox"/> Stimmt gar nicht <input type="checkbox"/>
2) Die Pflegekräfte haben stets so schnell wie möglich auf die Patientenklänge reagiert.	<input type="checkbox"/> Stimmt voll und ganz <input type="checkbox"/> Stimmt eher <input type="checkbox"/> Teils/teils <input type="checkbox"/> Stimmt eher nicht <input type="checkbox"/> Stimmt gar nicht <input type="checkbox"/> Ich habe nie geklingelt.
3) Die Pflegekräfte sind stets auf meine persönlichen Bedürfnisse eingegangen.	<input type="checkbox"/> Stimmt voll und ganz <input type="checkbox"/> Stimmt eher <input type="checkbox"/> Teils/teils <input type="checkbox"/> Stimmt eher nicht <input type="checkbox"/> Stimmt gar nicht
4) Die Pflegekräfte haben mich angemessen nach Schmerzen gefragt und mich diesbezüglich versorgt.	<input type="checkbox"/> Stimmt voll und ganz <input type="checkbox"/> Stimmt eher <input type="checkbox"/> Teils/teils <input type="checkbox"/> Stimmt eher nicht <input type="checkbox"/> Stimmt gar nicht <input type="checkbox"/> Ich hatte keine Schmerzen
5) Die Pflegekräfte haben mir gesagt oder gezeigt, was ich selbst tun kann, um meine Schmerzen zu lindern.	<input type="checkbox"/> Stimmt voll und ganz <input type="checkbox"/> Stimmt eher <input type="checkbox"/> Teils/teils <input type="checkbox"/> Stimmt eher nicht <input type="checkbox"/> Stimmt gar nicht <input type="checkbox"/> Ich hatte keine Schmerzen
6) Die Pflegekräfte haben sich immer bestmöglich um mein körperliches Wohlbefinden gekümmert.	<input type="checkbox"/> Stimmt voll und ganz <input type="checkbox"/> Stimmt eher <input type="checkbox"/> Teils/teils <input type="checkbox"/> Stimmt eher nicht <input type="checkbox"/> Stimmt gar nicht

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 2

7) Ich habe von den Pflegekräften verständliche Informationen erhalten.	<input type="checkbox"/> Stimmt voll und ganz <input type="checkbox"/> Stimmt eher <input type="checkbox"/> Teils/teils <input type="checkbox"/> Stimmt eher nicht <input type="checkbox"/> Stimmt gar nicht
8) Die Pflegekräfte haben mich stets verständnisvoll behandelt.	<input type="checkbox"/> Stimmt voll und ganz <input type="checkbox"/> Stimmt eher <input type="checkbox"/> Teils/teils <input type="checkbox"/> Stimmt eher nicht <input type="checkbox"/> Stimmt gar nicht
9) Die Pflegekräfte sind mir höflich und respektvoll begegnet.	<input type="checkbox"/> Stimmt voll und ganz <input type="checkbox"/> Stimmt eher <input type="checkbox"/> Teils/teils <input type="checkbox"/> Stimmt eher nicht <input type="checkbox"/> Stimmt gar nicht
10) Insgesamt betrachtet, haben mich die Pflegekräfte stets ausreichend über die Abläufe und nächsten Schritte in der Behandlung informiert.	<input type="checkbox"/> Stimmt voll und ganz <input type="checkbox"/> Stimmt eher <input type="checkbox"/> Teils/teils <input type="checkbox"/> Stimmt eher nicht <input type="checkbox"/> Stimmt gar nicht
11) Ich hatte jederzeit das Gefühl, mit den Pflegekräften über Ängste und Befürchtungen sprechen zu können.	<input type="checkbox"/> Stimmt voll und ganz <input type="checkbox"/> Stimmt eher <input type="checkbox"/> Teils/teils <input type="checkbox"/> Stimmt eher nicht <input type="checkbox"/> Stimmt gar nicht
12) Die Pflegekräfte haben sich genügend Zeit für meine Pflege genommen.	<input type="checkbox"/> Stimmt voll und ganz <input type="checkbox"/> Stimmt eher <input type="checkbox"/> Teils/teils <input type="checkbox"/> Stimmt eher nicht <input type="checkbox"/> Stimmt gar nicht
13) Ich hatte den Eindruck, dass die Pflegekräfte als Team gut zusammenarbeiten, um die bestmögliche Behandlung und Betreuung zu ermöglichen.	<input type="checkbox"/> Stimmt voll und ganz <input type="checkbox"/> Stimmt eher <input type="checkbox"/> Teils/teils <input type="checkbox"/> Stimmt eher nicht <input type="checkbox"/> Stimmt gar nicht

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 2

14) Andere (z.B. Angehörige) mussten bei mir Pflegeaufgaben übernehmen, weil die Pflegekräfte diese Aufgaben nicht erfüllt haben.	<input type="checkbox"/> Ja, häufig <input type="checkbox"/> Ja, gelegentlich <input type="checkbox"/> Ja, selten <input type="checkbox"/> Nein, nie
15) Die Pflegekräfte haben mir gesagt oder gezeigt, was ich beim Essen/Trinken und der Körperpflege/Hygiene beachten muss.	<input type="checkbox"/> Stimmt voll und ganz <input type="checkbox"/> Stimmt eher <input type="checkbox"/> Teils/teils <input type="checkbox"/> Stimmt eher nicht <input type="checkbox"/> Stimmt gar nicht
16) Die Pflegekräfte haben mir gesagt oder gezeigt, wie ich mich bewegen darf und soll.	<input type="checkbox"/> Stimmt voll und ganz <input type="checkbox"/> Stimmt eher <input type="checkbox"/> Teils/teils <input type="checkbox"/> Stimmt eher nicht <input type="checkbox"/> Stimmt gar nicht
17) Die Pflegekräfte haben mir gesagt oder gezeigt, wie ich mich körperlich belasten darf und soll.	<input type="checkbox"/> Stimmt voll und ganz <input type="checkbox"/> Stimmt eher <input type="checkbox"/> Teils/teils <input type="checkbox"/> Stimmt eher nicht <input type="checkbox"/> Stimmt gar nicht
18) Die Pflegekräfte haben mir den Zweck meiner Medikamente erklärt und mir gesagt oder gezeigt, wie ich diese nehmen muss.	<input type="checkbox"/> Stimmt voll und ganz <input type="checkbox"/> Stimmt eher <input type="checkbox"/> Teils/teils <input type="checkbox"/> Stimmt eher nicht <input type="checkbox"/> Stimmt gar nicht <input type="checkbox"/> War nicht notwendig
19) Die Pflegekräfte haben mir gesagt, ob und welche Hilfsmittel (z.B. Verbandsmaterialien, Vorlagen) für mich notwendig sind und wie ich diese bekomme.	<input type="checkbox"/> Stimmt voll und ganz <input type="checkbox"/> Stimmt eher <input type="checkbox"/> Teils/teils <input type="checkbox"/> Stimmt eher nicht <input type="checkbox"/> Stimmt gar nicht <input type="checkbox"/> War nicht notwendig
20) Die Pflegekräfte haben mir gesagt oder gezeigt, wie ich mit meinen Hilfsmitteln umgehen muss.	<input type="checkbox"/> Stimmt voll und ganz <input type="checkbox"/> Stimmt eher <input type="checkbox"/> Teils/teils <input type="checkbox"/> Stimmt eher nicht <input type="checkbox"/> Stimmt gar nicht <input type="checkbox"/> War nicht notwendig
21) Die Pflegekräfte haben mich bei meiner Entlassung unterstützt.	<input type="checkbox"/> Stimmt voll und ganz <input type="checkbox"/> Stimmt eher <input type="checkbox"/> Teils/teils <input type="checkbox"/> Stimmt eher nicht <input type="checkbox"/> Stimmt gar nicht

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 2

22) Die Pflegekräfte haben mir geholfen, selbst für meine Gesundheit sorgen zu können.	<input type="checkbox"/> Stimmt voll und ganz <input type="checkbox"/> Stimmt eher <input type="checkbox"/> Teils/teils <input type="checkbox"/> Stimmt eher nicht <input type="checkbox"/> Stimmt gar nicht
23) Bezogen auf die Zeit nach der Entlassung: Die Pflegekräfte haben mir gesagt, wann ich einen Arzt aufsuchen sollte.	<input type="checkbox"/> Stimmt voll und ganz <input type="checkbox"/> Stimmt eher <input type="checkbox"/> Teils/teils <input type="checkbox"/> Stimmt eher nicht <input type="checkbox"/> Stimmt gar nicht
24) Benötigen Sie seit dem Krankenhausaufenthalt mehr Hilfe bei der Essensversorgung (z.B. jemanden, der für Sie kocht, oder Essen auf Rädern)?	<input type="checkbox"/> Ja, viel mehr als vorher <input type="checkbox"/> Ja, etwas mehr als vorher <input type="checkbox"/> Nein
25) Benötigen Sie seit dem Krankenhausaufenthalt mehr Hilfe beim Einkaufen (durch Familie/Bekannte oder bezahlte Dienstleister)?	<input type="checkbox"/> Ja, viel mehr als vorher <input type="checkbox"/> Ja, etwas mehr als vorher <input type="checkbox"/> Nein
26) Benötigen Sie seit dem Krankenhausaufenthalt mehr Hilfe im Haushalt (durch Familie/Bekannte oder bezahlte Dienstleister)?	<input type="checkbox"/> Ja, viel mehr als vorher <input type="checkbox"/> Ja, etwas mehr als vorher <input type="checkbox"/> Nein
27) Benötigen Sie seit dem Krankenhausaufenthalt mehr Hilfe bei Ihren finanziellen Angelegenheiten (durch Familie/Bekannte oder Betreuer)?	<input type="checkbox"/> Ja, viel mehr als vorher <input type="checkbox"/> Ja, etwas mehr als vorher <input type="checkbox"/> Nein
28) Benötigen Sie seit dem Krankenhausaufenthalt mehr Hilfe bei der Körperpflege (durch Familie/Bekannte oder einen Pflegedienst)?	<input type="checkbox"/> Ja, viel mehr als vorher <input type="checkbox"/> Ja, etwas mehr als vorher <input type="checkbox"/> Nein
29) Sind Sie im Krankenhaus gestürzt, ausgerutscht oder abgerutscht, so dass Sie am Boden gelegen oder gesessen haben?	<input type="checkbox"/> Ja, mehrmals <input type="checkbox"/> Ja, einmal <input type="checkbox"/> Nein

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 2

30) Ich hatte nach dem Krankenhausaufenthalt zu den Pflegekräften....	<input type="checkbox"/> Mehr Vertrauen <input type="checkbox"/> Gleichbleibend viel Vertrauen <input type="checkbox"/> Gleichbleibend wenig Vertrauen <input type="checkbox"/> Weniger Vertrauen
31) Wenn Sie an die Pflegekräfte denken, würden Sie dieses Krankenhaus Ihrer Familie und Ihren Freunden empfehlen?	<input type="checkbox"/> Ja, auf jeden Fall <input type="checkbox"/> Ja, wahrscheinlich <input type="checkbox"/> Nein, wahrscheinlich nicht <input type="checkbox"/> Nein, auf keinen Fall
32) Wenn Sie an die Pflegekräfte denken, würden Sie beim nächsten Mal wieder dasselbe Krankenhaus wählen?	<input type="checkbox"/> Ja, auf jeden Fall <input type="checkbox"/> Ja, wahrscheinlich <input type="checkbox"/> Nein, wahrscheinlich nicht <input type="checkbox"/> Nein, auf keinen Fall
33) Gibt es noch etwas, was Ihnen zur Pflegequalität wichtig erscheint, aber im Fragebogen noch nicht berücksichtigt wurde?	(Mit Zeichenbegrenzung und Zeichenzähler)

5

Angaben zu Ihrer Person

P1) Wer hat diesen Fragebogen ausgefüllt?	<input type="checkbox"/> Die Patientin/der Patient selbst <input type="checkbox"/> Eine Angehörige/ein Angehöriger <input type="checkbox"/> Die Patientin/der Patient und eine Angehörige/ein Angehöriger gemeinsam <input type="checkbox"/> Die Patientin/der Patient zusammen mit einer Fachkraft
<i>Bitte beachten Sie: Alle Fragen sollen aus der Sicht derjenigen Person beantwortet werden, an die der Fragebogen adressiert war. Dies gilt auch für die folgenden Angaben zur Person.</i>	
P2) Bitte kreuzen Sie alle Punkte an, die auf Sie zutreffen: Ich habe durch eine bereits vor dem Krankenhausaufenthalt bestehende körperliche oder psychische Erkrankung oder Behinderung Schwierigkeiten ...	<input type="checkbox"/> ... bei Aktivitäten des täglichen Lebens, die eine Person in meinem Alter normalerweise bewältigen kann <input type="checkbox"/> ... bei der Arbeit oder in der Ausbildung <input type="checkbox"/> ... beim Zugang zu Gebäuden, Straßen oder Fahrzeugen <input type="checkbox"/> ... beim Lesen oder Schreiben <input type="checkbox"/> ... damit, wie andere Menschen sich aufgrund meiner Krankheit mir gegenüber verhalten <input type="checkbox"/> ... mit anderen Menschen zu kommunizieren, in Kontakt zu kommen oder zusammen zu sein

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 2

	<input type="checkbox"/> ... bei anderen Aktivitäten oder Situationen: _____ <input type="checkbox"/> Keine Schwierigkeiten bei den genannten Dingen
P3) Welche Staatsangehörigkeit(en) haben Sie?	(bitte eintragen)
P4) Leben Sie zurzeit mit einer Person aus Ihrem Haushalt in einer Ehe/Partnerschaft?	<input type="checkbox"/> ja <input type="checkbox"/> nein
P5) Welchen höchsten allgemeinbildenden Schulabschluss haben Sie? Wählen Sie den zutreffenden aus dieser Liste.	<input type="checkbox"/> derzeit Schülerin/Schüler <input type="checkbox"/> von der Schule abgegangen ohne Schulabschluss <input type="checkbox"/> Hauptschulabschluss (Volksschulabschluss) oder Polytechnische Oberschule der DDR mit Abschluss der 8./ 9. Klasse <input type="checkbox"/> Realschulabschluss (Mittlere Reife) oder Polytechnische Oberschule der DDR mit Abschluss der 10. Klasse <input type="checkbox"/> Fachhochschulreife, Abschluss einer Fachoberschule <input type="checkbox"/> Allgemeine oder fachgebundene Hochschulreife/Abitur (Gymnasium bzw. EOS, auch EOS mit Lehre) <input type="checkbox"/> Einen anderen Schulabschluss, und zwar: _____
P6) Welche beruflichen Ausbildungsabschlüsse haben Sie?	<i>(Mehrfachnennungen möglich)</i> <input type="checkbox"/> derzeit noch Schülerin/ Schüler, Studentin/Student oder Auszubildende/Auszubildender <input type="checkbox"/> keine <input type="checkbox"/> beruflich-betriebliche Berufsausbildung (Lehre) <input type="checkbox"/> berufsqualifizierender Abschluss** <input type="checkbox"/> Bachelor <input type="checkbox"/> Diplom, Master, Magister oder Staatsexamen <input type="checkbox"/> Promotion <input type="checkbox"/> anderer: _____

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 2

	<p>**einschließlich</p> <ul style="list-style-type: none"> • einen berufsqualifizierenden Abschluss einer beruflich-schulischen Ausbildung (Berufsfachschule, Kollegschule) • im Vorbereitungsdienst für den mittleren Dienst in der öffentlichen Verwaltung • den Abschluss einer einjährigen Ausbildung an einer Schule des Gesundheitswesens • den Abschluss einer zwei- bis dreijährigen Ausbildung an einer Schule des Gesundheitswesens • den Abschluss einer Ausbildung zum Erzieher/zur Erzieherin • den Abschluss einer Fachschule der DDR • den Abschluss einer Fach-, Meister-, Technikerschule, Verwaltungs- und Wirtschaftsakademie oder Fachakademie
<p>P7) Welche Erwerbssituation trifft auf Sie zu? Bitte beachten Sie, dass unter Erwerbstätigkeit jede bezahlte bzw. mit einem Einkommen verbundene Tätigkeit verstanden wird.</p>	<p><i>(Nur eine Nennung möglich!)</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> Vollzeit-erwerbstätig <input type="checkbox"/> Teilzeiterwerbstätig <input type="checkbox"/> Altersteilzeit (unabhängig davon, ob in der Arbeits- oder Freistellungsphase befindlich) <input type="checkbox"/> Geringfügig erwerbstätig, 400-Euro-Job, Minijob <input type="checkbox"/> „Ein-Euro-Job“ (bei Bezug von Arbeitslosengeld II) <input type="checkbox"/> Gelegentlich oder unregelmäßig beschäftigt <input type="checkbox"/> In einer beruflichen Ausbildung/Lehre <input type="checkbox"/> In Umschulung <input type="checkbox"/> Freiwilliger Wehrdienst <input type="checkbox"/> Bundesfreiwilligendienst oder freiwilliges soziales Jahr <input type="checkbox"/> Mutterschafts-, Erziehungsurlaub, Elternzeit oder sonstige Beurlaubung

Patients' Experience of Nursing Quality in Acute Hospitals (PENQuAH) – Supplementary File 2

	<input type="checkbox"/> Nicht erwerbstätig (einschließlich: Rentnern/-innen ohne Nebenverdienst, Vorruehständlern/-innen, Schülern/-innen oder Studierenden, die nicht gegen Geld arbeiten, Arbeitslosen)
<p>P8) Wie viele Personen leben ständig in Ihrem Haushalt, Sie selbst eingeschlossen? <i>Zu diesem Haushalt zählen alle Personen, die hier gemeinsam wohnen und wirtschaften. Denken Sie dabei bitte auch an alle im Haushalt lebenden Kinder.</i></p>	Bitte eintragen: ____
<p>P9) Wie hoch ist das durchschnittliche monatliche Nettoeinkommen Ihres Haushalts insgesamt?</p>	<input type="checkbox"/> Bis unter 450 Euro <input type="checkbox"/> Bis unter 1000 Euro <input type="checkbox"/> Bis unter 1500 Euro <input type="checkbox"/> bis unter 2000 Euro <input type="checkbox"/> bis unter 3000 Euro <input type="checkbox"/> bis unter 4000 Euro <input type="checkbox"/> bis unter 6000 Euro <input type="checkbox"/> bis unter 10 000 Euro <input type="checkbox"/> 10 000 und mehr
<p><i>Wir versichern Ihnen, dass Ihre Antwort nicht in Verbindung mit Ihrem Namen ausgewertet wird.</i></p>	
<p><i>Unter durchschnittlichem monatlichem Nettoeinkommen Ihres Haushalts ist die Summe zu verstehen, die sich aus Lohn, Gehalt, Einkommen aus selbst ständiger Tätigkeit, Rente oder Pension ergibt. Rechnen Sie bitte auch die Einkünfte aus öffentlichen Beihilfen, Einkommen aus Vermietung und Verpachtung, Vermögen, Wohngeld, Kindergeld und sonstige Einkünfte hinzu und ziehen Sie dann Steuern und Sozialversicherungsbeiträge ab</i></p>	