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Validation of a patient-reported measure of social support provided by nurses in breast cancer care (SuPP-N): based on a cross-sectional patient survey in 83 German hospitals

Johanna Sophie Lubasch ,[1] Susan Lee,[2] Markus Antonius Wirtz,[3] Holger Pfaff,[2] Lena Ansmann[1]

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[1]Organizational Health Services Research, School of Medicine and Health Sciences, Carl von Ossietzky University of Oldenburg, Oldenburg, Germany
[2]Institute of Medical Sociology, Health Services Research, and Rehabilitation Science (IMVR), Faculty of Human Sciences and Faculty of Medicine, University of Cologne, Cologne, Germany
[3]Department of Research Methods, University of Education Freiburg, Freiburg, Germany

Correspondence to
Johanna Sophie Lubasch; johanna.lubasch@uol.de

ABSTRACT

Objectives To validate the patient-reported measure of Social Support Perceived by Patients Scale-Nurses (SuPP-N).

Design/setting A secondary data analysis based on a cross-sectional breast cancer patient survey in 83 German hospitals. Patients were asked to give written informed consent before they were discharged. If they agreed to participate, the questionnaire was sent via mail to their home address after discharge.

Participants Of 5583 eligible patients, 4841 consented to participate in the study and 4217 returned completed questionnaires (response rate: 75.5 %). For the data analysis n=3954 respondents were included. On average, participants were 60 years old and mostly in cancer stages I and II.

Primary and secondary outcome measures Perceived social support was assessed with a three-item patient-reported scale (SuPP-N). Convergent validity and criterion-related validity were tested using the following constructs: trust in nurses, trust in the treatment team (Wake Forest Physician Trust Scale, adapted), quality of life (European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire), processes organisation, availability of nurses.

Results The structural equation model (SEM) assuming a one-dimensional structure of the instrument showed acceptable goodness of fit (root mean square error of approximation=0.04, Comparative Fit Index=0.96 and Tucker-Lewis Index=0.96; factor loadings ≥0.83). Hypothesis–consistent correlations with trust in nurses (beta=0.615; p<0.01) and trust in the treatment team (beta=0.264; p<0.01) proved convergent validity. Criterion-related validity was proved by its association with patients' quality of life (beta=−0.138; p<0.01), processes organisation (beta=−0.107; p<0.01) and the availability of nurses (beta=0.654; p<0.01).

Conclusion The results of the SEM identify potential important factors to foster social support by nurses in cancer care. In patient surveys, the SuPP-N can be used efficiently to measure patient-reported social support provided by nurses. The use of the scale can contribute to gain a better understanding of the relevance of social support provided by nurses for patients and to detect possible deficits and derive measures with the aim of improving the patient–nurse interaction.

Strengths and limitations of this study

- ► The hierarchical data structure of patients clustered in hospitals was considered within the structural equation model by a multilevel approach which was made possible by the good response rate and the large dataset of 3945 patients nested in 83 hospitals.
- ► The sample is largely representative of patients with breast cancer in the German state of North Rhine-Westphalia, which is the most populous German federal state (with about 20% of all patients with breast cancer in Germany).
- ► The screening instrument Social Support Perceived by Patients Scale-Nurses (SuPP-N) consists of only three items, which might limit the degree of differentiation, for example, when comparing groups, however, the short instrument can be efficiently included in patient surveys without major extensions of the questionnaire.
- ► Due to the cross-sectional study design, neither causal conclusions nor conclusions about the sensitivity of change of the SuPP-N instrument can be drawn.

BACKGROUND

Among women, breast cancer is the most frequent cancer worldwide, with 2.1 million women affected each year.[1] For many patients, a cancer diagnosis entails emotional distress, concerns about the therapy and feelings of uncertainty,[2] which in turn was found to increase the risk of mortality and physical symptoms.[3] Possible mechanisms explaining the relationship between distress and health outcomes are not fully clarified. On the one hand, the direct impact of distress on

the immune system may affect health outcomes (eg, cancer survival) and on the other hand, distress may impact health outcomes through self-care behaviours.[3] To handle stressors, patients with breast cancer need to be supported emotionally and socially.[2 4] In cancer care, nurses play a key role in providing social support since they are often accompanying patients throughout the time from diagnosis to treatment, or during palliative care.[5] However, evidence on factors affecting the provision of social support by nurses and the underlying mechanisms is lacking. Furthermore, no validated instrument measuring the provision of social support by nurses exists which could undermine the possibility of research to address the relevance of social support provided by nurses for patients as well as possible measures to foster the provision of social support.

Social support in patient care

Social support has an impact on various health outcomes, for example, in terms of reduced depressive symptoms and higher quality of life,[6 7] plays an important role in health maintenance[8] as well as disease management.[9 10] The provision of social support by family and friends is associated with higher quality of life among patients with lung cancer and better coping with the disease among patients with breast cancer.[4 11] Social support is defined as emotional, informational and instrumental support that assists a person in a burdensome situation.[12] In a conceptual analysis, Langford *et al*[13] provide an overview on predominant definitions and types of social support. Emotional support includes showing empathy, providing care and trust. Informational support is defined as assisting people in solving problems, whereas instrumental support is defined as providing tangible goods, services or aid.

In healthcare contexts, patients also need social support from healthcare professionals as part of the patient–professional interaction.[2 14 15] In this setting, the patient–professional interaction can be a source of social support by providing encouragement, praise, motivation, reassurance, advice and advocacy.[16 17] Studies revealed that a positive patient–provider interaction fosters physical and mental health, reduces recovery times, and might increase treatment effectiveness.[7 18 19] In addition to this, it was found that that the patient–provider interaction has an impact on patients' evaluation of their care.[20 21] The provision of social support by healthcare providers was furthermore found to be associated with aspects of quality of life.[11]

Various factors determine the patient–provider interaction. These factors are included in a patient–professional communication framework by Feldman-Stewart *et al*.[22] The framework includes characteristics of the patient, of the healthcare professional, and of the context in which the communication takes place. The impact of these factors on the patient–professional interaction has already been proven in previous studies. Studies investigating context characteristics have revealed that the patient–physician interaction in terms of providing social support is determined by process organisation, for example, coordination between wards and professions as well as lack of time.[23–25] Studies on the patient–nurse interaction indicate that an unfavourable nurse work environment characterised by lack of time and high work load has a negative impact.[26–28] Moreover, a previous systematic review pointed out that for patients with gynaecological cancer it is of great importance to have a nurse available at all times and to have the certainty of being able to contact a nurse with problems at any time.[5]

For patients with breast cancer, nurses play an important role in assisting patients throughout the disease.[5 29] Therefore, specially trained breast care nurses have been established in breast cancer care; their main tasks being patient advocates and educators, care coordinators and clinical experts.[30] Women with gynaecological cancer thereby experience specialist nurse as an important reference person understanding and meeting their individual needs and an easily accessible source of knowledge and support.[5] However, most studies investigating the factors influencing social support from healthcare professionals focus on physicians.[24 25] Data on social support provided by nurses are lacking. In order to investigate mechanisms and influencing factors of social support provided by nurses, there is a need for valid instruments.

Instruments measuring social support

To date, there are many different assessment instruments for social support that can be used for different purposes. The Personal Resource Questionnaire[31] and the Supportive Care Needs Survey-SF34,[32] for example, measure the need for social support but not whether it is provided. The Interpersonal Support Evaluation List[33] and the Medical Outcomes Survey-Social Support Survey[34] measure whether a person is supported but do not assess the source of support. The Perceived Social Support Scale[35] and the Multidimensional Scale of Perceived Social Support[36] measure the provision of social support by neighbours, friends or family. In the Social Support Questionnaire,[37 38] participants are asked to name persons providing social support and to rate the amount of social support received from these persons.

In the context of healthcare provision, however, to our knowledge, few valid instruments exist measuring social support provided by healthcare professionals. These include the Medical Interview Satisfaction Scale,[39] which inter alia measures informational support, and a scale measuring psychosocial care provided by physicians.[40–42] Congruently to the latter scale, the 'Social Support Perceived by Patients Scale-Nurses' (SuPP-N) has been developed,[40 43] but it has not yet been validated. Therefore, the aim of this study was to validate the patient-reported measure of SuPP-N in order to enable the investigation of mechanisms and influencing factors of social support provided by nurses as indicator of the patient–nurse interaction.

Table 1 Items of the SuPP-N instrument, frequency of response options, r_{it} and skewness

Item	Item content	Response options: Frequency (%)*†				Mean (SD)	Skewness (z-standardised)‡	r_{it}‡
		1	2	3	4			
suppn1	I could rely on the nurses when I had problems with my illness.	24 (0.6)	124 (3.1)	922 (23.3)	2884 (72.9)	3.69 (0.561)	−4.66	0.808
suppn2	The nurses supported me in a way that made it easier for me to deal with my illness.	34 (0.9)	176 (4.5)	1040 (26.3)	2704 (68.4)	3.62 (.613)	−4.14	0.857
suppn3	The nurses were willing to listen to my illness-related problems.	58 (1.5)	261 (6.6)	1128 (28.5)	2507 (63.4)	3.54 (.685)	−3.70	0.796

*'I strongly disagree' (1), 'I somewhat disagree' (2), 'I somewhat agree' (3), 'I strongly agree' (4).
†Threshold >0.3 for good selectivity of the item, [c] normal distribution if smaller than 2.58.
‡r_{it}=Discrimination (corrected item–total correlation).
SuPP-N, Social Support Perceived by Patients Scale-Nurses.

METHODS

Setting and design

The SuPP-N is being used in annual cross-sectional patient surveys in German breast cancer centres in North Rhine-Westphalia since 2009.[44] Each year, data are collected using a breast cancer-specific version of the Cologne Patient Questionnaire (CPQ-BC), which consists of various validated and internationally established instruments and instruments that have been used in the German healthcare context widely and shown good reliability. Internal consistency of the SuPP-N scale was analysed annually and Cronbach's alpha ranged from 0.91 to 0.93 (table 1).[44]

As a next step, in the present secondary data analysis, the measurement model as well as the convergent and the criterion-related validity of the SuPP-N scale was tested. The analysis is based on data collected in 83 hospitals accredited as breast cancer in the year 2013. Since the survey is conducted annually for evaluation purposes of the hospitals in the first place, the questionnaire is regularly revised together with the hospitals. As part of a realignment, scales suitable for validating the SuPP-N were no longer included in the questionnaire after 2013. The psychometric quality of the SuPP-N was evaluated following Kline's[45] procedure. One structural equation model (SEM) was used to test the one-dimensional structure of the scale as well as construct validity in terms of convergent validity and criterion-related validity. The clustered structure was accommodated by adjusting standard errors (type=complex in Mplus), assuming invariant factor structures between the levels. For descriptive statistics, SPSS V.25 was used. To develop and test the SEM, the maximum likelihood estimation procedure[45] of the Mplus V.8 software was used. To assess whether constructs can be reliably estimated from their indicators' local fit indices, the following parameters were estimated: average variance extracted (AVE) ≥0.5, factor reliability ≥0.6, reliability (Cronbach's alpha)≥0.7, residual correlations ≤0.3 and discrimination of the items (r_{it}) >0.5. The recommended thresholds were used to determine a good model fit of the SEM: root mean square error of approximation as well as standardized root mean square residual ≤0.08 (acceptable), ≤0.05 (good) and Incremental Fit Indexes (Comparative Fit Index and Tucker-Lewis Index (≥0.95: acceptable; ≥0.97: good).

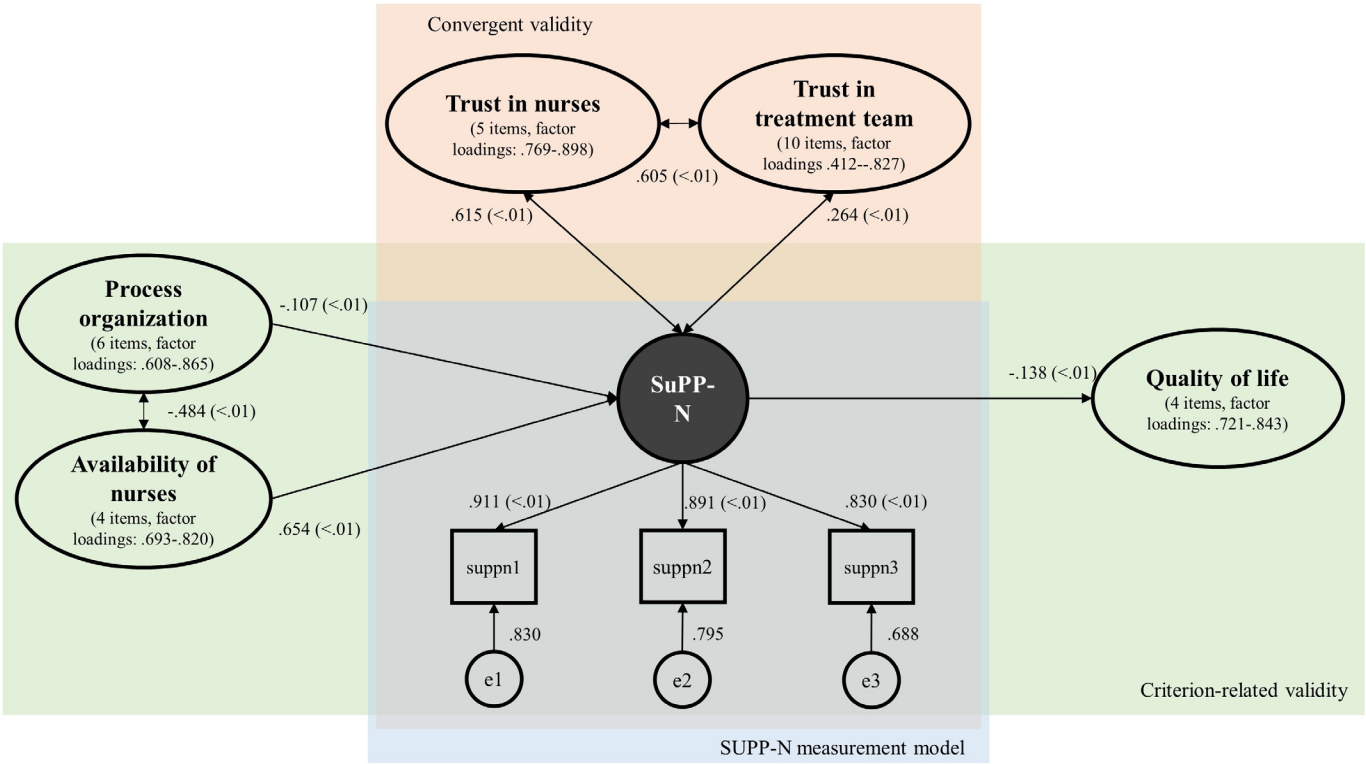
To confirm the one-dimensional structure of the scale, factor loadings of the three items of the SuPP-N instrument were verified. Loadings above 0.71 were interpreted as excellent, 0.63 as very good, 0.55 as good, 0.45 as fair and 0.32 as poor.[45]

To test convergent validity correlations of the SuPP-N instrument were analysed with theoretically related constructs of the provision of social support by nurses: trust in nurses (Cronbach's alpha=0.92) and trust in the treatment team (Cronbach's alpha=0.84).

To test criterion-related validity, we used two factors that were found to be predictors of the provision of social support, namely hospital process organisation[24] and nurse availability,[5] and one factor that was found to be affected by the provision of social support, namely patient quality of life.[11] In the SEM, we, therefore, assume that process organisation and the availability of nurses have an impact on social support, and social support in turn affects quality of life (see figure 1).

Participants

Patients were included in the survey if they (1) were older than 18 years, (2) had undergone inpatient surgery between 1 February 2013 and 31 July 2013, for newly diagnosed breast cancer, (3) had at least one malignancy and (4) had at least one postoperative histological evaluation. To participate in the study, patients were asked to give written informed consent before they were discharged. If they agreed to participate, the questionnaire was sent via mail to their home address 1 week after discharge. Of 5583 patients being cared for in the defined period, 4841 consented to participate in the study and 4217 returned completed questionnaires (response rate: 75.5 %). On



Measurement model only displayed for the construct SUPP-N.; e1-e3 = error terms with indicator reliability

Figure 1 Standardised estimates and p values (in brackets) of the SEM. SEM, structural equation model; SuPP-N, Social Support Perceived by Patients Scale-Nurses.

average questionnaires were returned 20 days after they were sent to the patients, subsequently on average 27 days after discharge. Data from participants who answered fewer than 30% of the items of the total questionnaire was deleted, resulting in an analysis sample of 4146. The number of analysed respondents in this study was only 3954 because 28 male participants were deleted from the dataset and 164 of the remaining respondents had missing values on at least one of the SuPP-N items. Male participants were excluded from the analyses because the number of men in the dataset was too small for a gender-stratified analysis.

Instruments

The SuPP-N scale

The SuPP-N has been adapted from the scale measuring psychosocial care provided by physicians[40–42] by the same authors.[40 43] The SuPP-N scale consists of three items (table 1), which have been extensively pretested in cognitive interviews with patients before using the scale in patient surveys. Respondents are asked to rate the items on a four-point Likert scale raging form 'strongly agree' to 'strongly disagree.' In the years 2009–2016, mean scale values ranged from 3.60 to 3.63 (with 4 being the highest achievable value, meaning high perceived support). The patients are not asked to answer the items regarding a particular nurse during their hospital stay, but to give a general assessment of the support they received by the nursing staff. Therefore, the assessment refers to registered nurses as well as nursing students and nursing assistants.

Patients' trust in nurses

Adapted from a validated instrument measuring patients' trust in physicians,[41 42] the same authors developed a scale measuring patients' trust in nurses within the CPQ-BC. In previous studies,[44] it showed good psychometric properties (Cronbach's alpha=0.92). The scale consists of five items, for example, 'I completely trusted in the nurses on the ward.' Respondents are asked to answer on a four-point Likert scale ranging from (1) 'I strongly disagree' to (4) 'I strongly agree.'

Patients' trust in the treatment team

The scale measuring patients' trust in their treatment team is based on the Wake Forest Physician Trust Scale, which was developed by Hall *et al*.[46] It has been translated and transferred into different contexts and has shown good reliability and validity (Cronbach's alpha ≥0.84).[47–51] For the purpose of this study, the scale has been professionally translated into German[52] and was adapted to measure trust in the treatment team by simply replacing the term 'physician' by 'treatment team'. Moreover, for the retrospective patient survey after discharge, the items were rephrased using past tense (Cronbach's alpha 0.88) (sample item 'The treatment team did whatever it took to get me all the care I needed.'). The scale consists of ten items being answered on a five-point Likert scale ranging

from 1 'strongly agree' to 5 'strongly disagree'. Prior to the analysis, the items were recoded so that higher values indicated higher levels of trust.

Process organisation

The scale measuring the patient's experience with the process organisation of the hospital showed good psychometric measures in previous studies (Cronbach's alpha=0.82).[44] The six items measure how patients experience dynamic work processes during their hospital stay in terms of communication processes between healthcare professionals, waiting times or the coordination between healthcare professionals. The items (eg, 'I got the impression that there were communication problems between the physicians and the nursing staff') were answered on a four-point Likert scale ranging from (1) 'strongly disagree' to (4) 'strongly agree.' Higher values indicate higher deficits in the process organisation.

Patients' perception of nurses' availability

The availability of nurses was measured by four items (sample item 'The nurses were always available.'). The items measure whether patients and their relatives had a contact person among the nurses and whether the nurses were available when the patients had questions. The items showed good psychometric measures (Cronbach's alpha=0.87) in previous analyses.[53] Participants were asked to rate the items on a four-point Likert scale ranging from (1) 'strongly disagree' to (4) 'strongly agree.' Higher values indicate higher availability of nurses.

Cancer-specific quality of life

Cancer-specific quality of life was measured using the EORTC QLQC-30 (European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire).[54] The QLQ-C30 consists of 30 items and includes inter alia four functioning scales (physical, role, emotional, cognitive and social functioning), three cancer-specific symptom scales as well as one global health scale. For our validation study, we used only the four-item emotional functioning subscale because social support provided by nurses can be assumed to show the highest association with this subscale. Participants were asked to answer on a four-point Likert scale ranging from (1) 'not at all' to (4) 'very much' (sample item 'Did you feel irritable?'). The instrument is widely used and demonstrated good psychometric properties and clinical validity in earlier studies (Cronbach's alpha=0.84).[55 56] Higher values indicate more problems concerning the emotional functioning.

RESULTS

The number of patients surveyed per hospital ranges from 3 to 186. The mean age of participants was 60 years and most participants in the sample were classified with stage I or stage II according to the Union for International Cancer Control (see table 2). Moreover, most patients had undergone breast conserving therapy and indicated lower secondary school education to be the highest level of education. The provision of social support by nurses was generally rated as high (table 2). According to the structured quality reports, most of the hospitals were teaching hospitals (see table 3). Furthermore, most hospitals were in charitable ownership. The number of patient beds per hospital ranged from 43 to 1422 beds (average=526 beds).

To validate the SuPP-N scale, the first step was to analyse the one-dimensional structure of the SuPP-N instrument by verifying the factor loadings of the three items (see figure 1). The mean SuPP-N score for all respondents was 3.62.

The measures of global fit (table 4) reveal that the SEM appears to have an appropriate model fit. Local fit indices verified that the social capital construct is reliably measured by its indicators. All standardised factor loadings were significant ($p<0.01$) and higher than 0.830 (critical value ≥0.5) (see figure 1). More than 50% of the indicator variance is associated with the underlying latent construct on average (AVE=0.83). Furthermore, Cronbach's alpha (=0.91), factor reliability (=0.91) and residual correlations (|max|=−0.048; critical value ≤0.25 (not displayed)) indicate that the item information can be explained to a large extent by a single underlying construct.

We analysed correlations with patient's trust in nurses and patient's trust in the treatment team in the SEM (see figure 1) to test convergent validity. The SuPP-N instrument correlated significantly ($p\leq0.01$) with the theoretically related constructs in both the bivariate analyses and in the full model: patient's trust in nurses (beta=0.615; $p<0.01$) and patient's trust in treatment team (beta=0.264; $p<0.01$).

Concerning criterion-related validity the estimations of the SEM (figure 1) showed significant paths from SuPP-N to the patients' quality of life (beta=−0.138; $p<0.01$), processes organisation (beta=−0.107; $p<0.01$) and the availability of nurses (beta=0.654; $p<0.01$).

DISCUSSION

Validity of the SuPP-N scale

The aim of this validation study was to examine the reliability and validity of an instrument to measure social support provided by nurses in a sample of patients with breast cancer.

The results show that the three items of the SuPP-N instrument can be adequately modelled as indicators of a single underlying latent construct. Convergent validity of the SuPP-N instrument was indicated by correlations found with instruments measuring similar constructs (trust in nurses (beta=0.615; $p<0.01$) and trust in the treatment team (beta=0.264; $p<0.01$)). Nevertheless, it was shown that the construct can be differentiated from these similar constructs. Finally, criterion-based validity show correlations between the social support construct and the patients' quality of life (beta=−0.138; $p<0.01$), process organisation (beta=−0.107; $p<0.01$) as well as the availability of nurses (beta=0.654; $p<0.01$).

Table 2 Age and cancer stage of the participants with mean values of the SuPP-N scale

	Frequency (n)	%*	SuPP-N mean
Age			
18–39 years	141	3.6	3.65
40–49 years	639	16.2	3.63
50–59 years	1136	28.7	3.60
60–69 years	1081	27.3	3.63
70–79 years	749	18.9	3.61
80 years and older	186	4.7	3.62
Missing	22	0.6	–
Education			
No lower secondary school certificate	73	1.9	3.54
Lower secondary school certificate	1666	42.1	3.64
Intermediate secondary school certificate	1084	27.4	3.62
Entrance qualification for university of applied science or university	1023	25.9	3.58
Missing	108	2.7	–
Employment status			
Full-time	833	21.1	3.60
Part-time	729	18.4	3.64
Housewife	559	14.1	3.60
Unemployed	124	3.1	3.55
Pensioner	1487	37.6	3.55
Unemployed due to other reasons	106	2.7	3.62
Missing	116	2.9	–
Health insurance status			
Public	2838	71.8	3.62
Public with additional private insurance	608	15.4	3.60
Private	434	11.0	3.59
Missing	104	2.6	–
Cancer stage (UICC staging)†			
Stage 0	420	10.6	3.58
Stage I	1530	38.9	3.61
Stage II	1052	26.6	3.63
Stage III	316	8.0	3.60
Stage IV	140	3.5	3.59
Missing	488	12.3	–
Type of surgery			
Mastectomy without reconstruction during the same surgery	693	17.5	3.60
Mastectomy with reconstruction during the same surgery	255	6.4	3.64
Breast-conserving therapy	2862	72.4	3.62
Missing	144	3.6	–
Total	**3954**	**100.0**	**3.62**

*Due to rounding, percentages might not add up to exactly 100%.
†Staging classified according to the UICC.
SuPP-N, Social Support Perceived by Patients Scale-Nurses; UICC, Union for International Cancer Control.

Discussion of SEM results

The results of our study supplement findings from Ansmann *et al*[23] showing associations between social support provided by physicians and the hospital's process organisation. Ansmann *et al*[23] presume that in hospitals having deficits concerning their process organisation, physicians may have less time for their patients. It is furthermore assumed that physicians are distracted by work organisation problems which may in turn affect patient–physician interaction. Congruently to this, based

Table 3 Characteristics of the hospital sample

Variable	Response trait	N (%)* (n=83)
Teaching status	Non-teaching	14 (16.9)
	Academic teaching hospital	64 (77.1)
	University hospital	5 (6.0)
Hospital ownership status	For-profit ownership	6 (7.2)
	Public ownership	17 (20.5)
	Charitable ownership	60 (72.3)
	Minimum/maximum	**Mean (SD)**
Hospital size (no of beds)	43/1422	526 (284)

*Note: Due to rounding, percentages might not add up to exactly 100%.

on the results of the SEM in this study we assume that also nurses working in hospitals with problems in process organisation may be preoccupied by organisational tasks. This in turn might leave less time for communication with patients and may thus impact the nurse–patient relationship. Although data are not sufficient to prove this pathway conclusively, we suggest that investing into a good process organisation may foster the nurse–patient interaction. In addition to this, the results of our SEM supplement previous findings showing that social support provided by healthcare professionals is associated with several aspects of quality of life, inter alia emotional functioning among patients with lung cancer.[11] The results of the SEM in this study indicate that social support provided by nurses is also associated to emotional functioning among patients with breast cancer. One possible explanation for this might be that the provision of social support has the potential to reduce depressive symptoms and to assists patients to cope with their disease,[4 6] which might in turn improve emotional quality of life. However, our data cannot prove this pathway and neither our survey nor the results of previous studies can make a clear statement as to whether social support improves the patients' quality of life or whether patients with higher quality of life receive or report more social support.[11] If the former is true interventions fostering social support provided by nurses may be useful to improve the quality of life of patients with breast cancer. Additionally, our results showing an association between the availability of nurses and the perception of social support are in line with previous results. Cook *et al*[5] found out, that for patients with gynaecological cancer it is of great importance to have a nurse available at all times and to have the certainty of being able to contact a nurse with problems at any time. It may be discussed that patients with cancer therefore should have access to specialist nurses at key points of their disease process.

Strengths and limitations

The presented findings must be considered in light of methodological limitations. The screening instrument SuPP-N consists of only three items, which might limit the degree of differentiation, for example, when comparing groups. On the other side, the SuPP-N instrument is a short instrument that can be efficiently included in patient surveys. Due to the cross-sectional study design, neither causal conclusions nor conclusions about the sensitivity of change of the SuPP-N instrument can be drawn. Moreover, the instruments measuring trust in nurses, process organisation and the availability of nurses, which have been used for convergent and criterion-related validity, have previously been validated by exploratory factor analysis and reliability analysis, but not by confirmatory factor analysis. However, the instruments' psychometric quality was confirmed by the validity and reliability analyses presented. Given that all investigated scales originate from the same survey, the explanation of variance might possibly be overestimated due to common method bias.[57] Additionally, it must be noted that the SuPP-N measure showed ceiling effects (mean value 3.62 with a maximum possible value of 4.0) which is often observed in similar scales, such as trust in physicians.[42] Furthermore, we are aware that the secondary data from 2013 might not reflect recent trends in healthcare. However, we believe that the relationships we found vary only in terms of their strength and tend to be fundamental and stable. A strength of our study is that the hierarchical data structure of patients clustered in hospitals was considered within the SEM by a multilevel approach. This was made possible by the good response rate and the large dataset of 3945 patients nested in 83 hospitals. In addition to this, the sample is largely representative of patients with breast cancer in the German state of North Rhine-Westphalia, which is the most populous German federal state (with about 20% of all patients with breast cancer in Germany). In order not to overload our model, we did not adjust our

Table 4 Indicators of global model fit of the SEM

	χ^2	df	Cronbach's alpha	RMSEA	SRMR	TLI	CFI
Thresholds for acceptable model fit			≥0.7	≤0.08	≤0.08	≥0.95	≥0.95
SEM	2610.01	447	0.91	0.04	0.05	0.96	0.96
χ^2; df							

CFI, Comparative Fit Index; RMSEA, root mean square error of approximation; SEM, structural equation model; SRMR, Standardized Root Mean Square Residual; TLI, Tucker-Lewis Index.

analysis for patient characteristics. In a previous analysis, results showed that native language, age and insurance status of patients with breast cancer are associated with the perception of social support provided by nurses.[58] However, patient characteristics only explained 14% of variance between hospitals, whereby the process organisation played a much greater role (over 50% of explained variance between the hospitals). We, therefore, assume that the missing adjustment does not substantially affect the validity of the SuPP-N scale. A further strength of our study is that two of the constructs used to validate the SuPP-N scale are widely used and previously validated instruments, namely the EORTC QLQC-30 and the Wake Forest Physician Trust Scale. Still, the measure's applicability should be further demonstrated by means of validations in different contexts and languages.

CONCLUSIONS

The SuPP-N instrument represents a short and valid instrument to measure social support provided by nurses. It can be used as a valid instrument to gain a better understanding of the buffering effect of social support provided by nurses for patients. Therefore, studies should be conducted on associations between social support and patient outcomes, and mechanisms behind these associations should be further studied. Moreover, the SuPP-N instrument could be used in future studies in order to test interventions to foster social support provided by nurses as well as to validate the instrument' sensitivity to change. Since social support provided by nurses showed significant associations to organisational processes in the hospital and furthermore was associated to patients' quality of life, the SuPP-N scale may be used for quality assessment purposes in hospitals. Therefore, the instrument could be integrated into patient surveys to detect possible deficits and derive measures with the aim of improving the patient–nurse interaction.

Our SEM indicates that the availability of nurses has an impact on the receipt of social support by nurses, which is in line with previous results.[5] We, therefore, assume that for patients, it might be important to have a contact person among nurses and that nurses are available when they have questions. To address this, investing into the professionalisation of nurses may be expedient. Specially trained breast care nurses, for example, coordinate care, are aware of patients' needs and are accessible for patients.[5 29 30] Breast care nurses thus can devote a lot of time to patients and meet unmet needs of social support.[29] We, therefore, assume that breast care nurses have the potential to compensate in communication and interaction with patients for what other nurses cannot achieve in their stressful daily work. In other contexts, further evidence exists that primary nursing enables relationship-building with patients.[59] Primary nurses are responsible for the assessment, planning, organisation and evaluation of a patient's care throughout the whole hospital stay.[60] Furthermore, our SEM indicated that less organised processes are associated with less social support. To address this, we suggest that interventional approaches should focus on the improvement of process organisation to unburden nurses.

Twitter Holger Pfaff @PfaffHolger

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Ethics approval Ethical advice was given by the ethics committee of the University of Cologne (reference nr. 06-010). The study was carried out is in accordance with the Declaration of Helsinki. Before they were discharged from the hospital, patients to be included in the study were asked to give written consent to participate in the survey.

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ORCID iD
Johanna Sophie Lubasch http://orcid.org/0000-0002-4315-1816

REFERENCES

1 World Health Organization (WHO). cancer: breast cancer, 2019. Available: https://www.who.int/cancer/prevention/diagnosis-screening/breast-cancer/en/ [Accessed 27 Feb 2019].
2 Aldaz BE, Treharne GJ, Knight RG, *et al*. Oncology healthcare professionals' perspectives on the psychosocial support needs of cancer patients during oncology treatment. *J Health Psychol* 2017;22:1332–44.
3 Barry V, Stout ME, Lynch ME, *et al*. The effect of psychological distress on health outcomes: a systematic review and meta-analysis of prospective studies. *J Health Psychol* 2020;25:227–39.
4 Arora NK, Finney Rutten LJ, Gustafson DH, *et al*. Perceived helpfulness and impact of social support provided by family, friends, and health care providers to women newly diagnosed with breast cancer. *Psychooncology* 2007;16:474–86.
5 Cook O, McIntyre M, Recoche K, *et al*. Experiences of gynecological cancer patients receiving care from specialist nurses: a qualitative systematic review. *JBI Database System Rev Implement Rep* 2017;15:2087–112.
6 Wang H-H, Wu S-Z, Liu Y-Y. Association between social support and health outcomes: a meta-analysis. *Kaohsiung J Med Sci* 2003;19:345–50.
7 Evans EC. Exploring the nuances of Nurse-Patient interaction through concept analysis: impact on patient satisfaction. *Nurs Sci Q* 2016;29:62–70.
8 Callaghan P, Morrissey J. Social support and health: a review. *J Adv Nurs* 1993;18:203–10.

9 Badura B, Kaufhold G, Lehmann H. Soziale Unterstützung und Krankheitsbewältigung—Neue Ergebnisse aus der Oldenburger Longitudinalstudie 4 ½ Jahre nach Erstinfarkt. [Social support and coping with illness - New results from the Oldenburg Longitudinal Study 4 ½ years after initial infarction. *Psychotherapie, Psychosomatik, Medizinische Psychologie* 1988;38:48–58.
10 Pfaff H. *Stressbewältigung und soziale Unterstützung: Zur sozialen Regulierung individuellen Wohlbefindens [Stress management and social support: On the social regulation of individual well-being*. Weinheim: Deutscher Studien Verlag, 1989.
11 Luszczynska A, Pawlowska I, Cieslak R, *et al*. Social support and quality of life among lung cancer patients: a systematic review. *Psychooncology* 2013;22:2160–8.
12 Caplan G. *Support systems and community mental health: lectures on concept development*. Pasadena, CA, US: Behavioral Publications, 1974.
13 Langford CP, Bowsher J, Maloney JP, *et al*. Social support: a conceptual analysis. *J Adv Nurs* 1997;25:95–100.
14 Drageset S, Lindstrøm TC, Giske T, *et al*. "The support I need": women's experiences of social support after having received breast cancer diagnosis and awaiting surgery. *Cancer Nurs* 2012;35:E39–47.
15 Makabe R, Nomizu T. Social support and psychological and physical states among Japanese women with breast cancer before and after breast surgery. *Oncol Nurs Forum* 2007;34:883–9.
16 Kaplan HB. Health, disease, and the social structure. In: *Handbook of medical sociology*, 1989: 46–68.
17 Street RL, Makoul G, Arora NK, *et al*. How does communication heal? pathways linking clinician-patient communication to health outcomes. *Patient Educ Couns* 2009;74:295–301.
18 Neumann M, Edelhäuser F, Kreps GL, *et al*. Can patient-provider interaction increase the effectiveness of medical treatment or even substitute it?--an exploration on why and how to study the specific effect of the provider. *Patient Educ Couns* 2010;80:307–14.
19 Chen Q, Beal EW, Schneider EB, *et al*. Patient-Provider communication and health outcomes among individuals with Hepato-Pancreato-Biliary disease in the USA. *J Gastrointest Surg* 2018;22:624–32.
20 Georgopoulou S, Prothero L, D'Cruz DP, D'Cruz DP. Physician-patient communication in rheumatology: a systematic review. *Rheumatol Int* 2018;38:763–75.
21 Kartika IR. Nurses–patients interaction model and outpatients' satisfaction on nursing care. *NCOAJ* 2018;5.
22 Feldman-Stewart D, Brundage MD, Tishelman C, *et al*. A conceptual framework for patient-professional communication: an application to the cancer context. *Psychooncology* 2005;14:801–9.
23 Ansmann L, Kowalski C, Ernstmann N, *et al*. Patients' perceived support from physicians and the role of hospital characteristics. *Int J Qual Health Care* 2012;24:501–8.
24 Ansmann L, Wirtz M, Kowalski C, *et al*. The impact of the hospital work environment on social support from physicians in breast cancer care. *Patient Educ Couns* 2014;96:352–60.
25 Thind A, Maly R. The surgeon-patient interaction in older women with breast cancer: what are the determinants of a helpful discussion? *Ann Surg Oncol* 2006;13:788–93.
26 Kruijver IP, Kerkstra A, Bensing JM, *et al*. Nurse-patient communication in cancer care. A review of the literature. *Cancer Nurs* 2000;23:20–31.
27 Norouzinia R, Aghabarari M, Shiri M, *et al*. Communication barriers perceived by nurses and patients. *Glob J Health Sci* 2015;8:65–74.
28 West E, Barron DN, Reeves R. Overcoming the barriers to patient-centred care: time, tools and training. *J Clin Nurs* 2005;14:435–43.
29 Halkett G, Arbon P, Scutter S, *et al*. The role of the breast care nurse during treatment for early breast cancer: the patient's perspective. *Contemp Nurse* 2006;23:46–57.
30 Luck L, Chok HN, Scott N, *et al*. The role of the breast care nurse in patient and family care. *J Clin Nurs* 2017;26:3422–9.
31 Brandt PA, Weinert C. The PRQ—a social support measure. *Nurs Res* 1981;30:277–80.
32 Bonevski B, Sanson-Fisher R, Girgis A, *et al*. Evaluation of an instrument to assess the needs of patients with cancer. supportive care review group. *Cancer* 2000;88:217–25.
33 Cohen S, Hoberman HM. Positive events and social supports as buffers of life change Stress1. *J Appl Soc Psychol* 1983;13:99–125.
34 Sherbourne CD, Stewart AL. The MOS social support survey. *Soc Sci Med* 1991;32:705–14.
35 Procidano ME, Heller K. Measures of perceived social support from friends and from family: three validation studies. *Am J Community Psychol* 1983;11:1–24.
36 Zimet GD, Dahlem NW, Zimet SG, *et al*. The multidimensional scale of perceived social support. *J Pers Assess* 1988;52:30–41.
37 Sarason IG, Levine HM, Basham RB, *et al*. Assessing social support: the social support questionnaire. *J Pers Soc Psychol* 1983;44:127–39.
38 Sarason IG, Sarason BR, Shearin EN, *et al*. A brief measure of social support: practical and theoretical implications. *J Soc Pers Relat* 1987;4:497–510.
39 Meakin R, Weinman J. The 'Medical Interview Satisfaction Scale' (MISS-21) adapted for British general practice. *Fam Pract* 2002;19:257–63.
40 Pfaff H, ed. *Der Kölner Patientenfragebogen (KPF): Entwicklung und Validierung eines Fragebogens zur Erfassung der Einbindung des Patienten als Kotherapeuten [The Cologne Patient Questionnaire (CPQ): Development and Validation of a Questionnaire to Assess Patient Involvement as a Therapist]*. Sankt Augustin : Asgard-Verl, 2003.
41 Ommen O, Wirtz M, Janssen C, *et al*. Psychometric evaluation of an instrument to assess patient-reported 'psychosocial care by physicians': a structural equation modeling approach. *Int J Qual Health Care* 2009;21:190–7.
42 Ommen O, Wirtz M, Janssen C, *et al*. Validation of a theory-based instrument measuring patient-reported psychosocial care by physicians using a multiple indicators and multiple causes model. *Patient Educ Couns* 2010;80:100–6.
43 Caplan RD, Cobb S, French JRP. Job demands and worker health: main effects and occupational differences. *Ann Arbor* 1980.
44 Ansmann L, Kowalski C, Pfaff H. Ten years of patient surveys in accredited breast centers in North Rhine-Westphalia. *Geburtshilfe Frauenheilkd* 2016;76:37–45.
45 Kline RB. *Principles and practice of structural equation modeling*. 3rd edn. New York: Guilford Press, 2011.
46 Hall MA, Zheng B, Dugan E, *et al*. Measuring patients' trust in their primary care providers. *Med Care Res Rev* 2002;59:293–318.
47 Hillen MA, Koning CCE, Wilmink JW, *et al*. Assessing cancer patients' trust in their oncologist: development and validation of the trust in oncologist scale (TiOS). *Support Care Cancer* 2012;20:1787–95.
48 Bachinger SM, Kolk AM, Smets EMA. Patients' trust in their physician--psychometric properties of the Dutch version of the "Wake Forest Physician Trust Scale". *Patient Educ Couns* 2009;76:126–31.
49 Donnelly V, Lynch A, Devlin C, *et al*. Therapeutic alliance in forensic mental health: coercion, consent and recovery. *Ir J Psychol Med* 2011;28:21–8.
50 Dugan E, Trachtenberg F, Hall MA. Development of abbreviated measures to assess patient trust in a physician, a health insurer, and the medical profession. *BMC Health Serv Res* 2005;5:64.
51 Müller E, Zill JM, Dirmaier J, *et al*. Assessment of trust in physician: a systematic review of measures. *PLoS One* 2014;9:e106844.
52 Guillemin F, Bombardier C, Beaton D. Cross-cultural adaptation of health-related quality of life measures: literature review and proposed guidelines. *J Clin Epidemiol* 1993;46:1417–32.
53 Pfaff H, Alich M, Lena A. Ergebnisse der Patientinnenbefragung in den Brustzentren Nordrhein-Westfalens 2013 [Results of the patient survey in the breast centers of North Rhine-Westphalia 2013]. *Köln*2013.
54 Aaronson NK, Ahmedzai S, Bergman B, *et al*. The European Organization for Research and Treatment of Cancer QLQ-C30: a quality-of-life instrument for use in international clinical trials in oncology. *J Natl Cancer Inst* 1993;85:365–76.
55 Fayers PM, Aaronson NK, Bjordal K. *EORTC QLQ-C30 scoring manual*. 3rd edn. Brussels, 2001.
56 Bjordal K, de Graeff A, Fayers PM, *et al*. A 12 country field study of the EORTC QLQ-C30 (version 3.0) and the head and neck cancer specific module (EORTC QLQ-H&N35) in head and neck patients. EORTC Quality of Life Group. *Eur J Cancer* 2000;36:1796–807.
57 Podsakoff PM, MacKenzie SB, Lee J-Y, *et al*. Common method biases in behavioral research: a critical review of the literature and recommended remedies. *J Appl Psychol* 2003;88:879–903.
58 Lubasch JS, Lee S, Kowalski C, *et al*. Hospital processes and the Nurse-Patient interaction in breast cancer care. findings from a cross-sectional study. *Int J Environ Res Public Health* 2021;18:8224.
59 Naef R, Ernst J, Petry H. Adaption, benefit and quality of care associated with primary nursing in an acute inpatient setting: a cross-sectional descriptive study. *J Adv Nurs* 2019;75:2133–43.
60 Manthey M. Aka primary nursing. *J Nurs Adm* 2003;33:369–70.