Using Publicly Reported Nursing-Sensitive Screening Indicators to Measure Hospital Performance

The Netherlands Experience in 2011

Dewi Stalpers ▼ Dimitri van der Linden ▼ Marian J. Kaljouw ▼ Marieke J. Schuurmans

Background: Deliberate screening allows detection of health risks that are otherwise not noticeable and allows expedient intervention to minimize complications and optimize outcomes, especially during critical events like hospitalization. Little research has evaluated the usefulness of screening performance and outcome indicators as measures to differentiate nursing quality, although policymakers are using them to benchmark hospitals.

Objectives: The aims of this study were to examine hospital performance based on nursing-sensitive screening indicators and to assess associations with hospital characteristics and nursing-sensitive outcomes for patients.

Methods: A secondary use of nursing-sensitive data from the Dutch Health Care Inspectorate was performed, including the mandatory screening and outcome indicators related to delirium, malnutrition, pain and pressure ulcers. The sample consisted of all 93 hospitals in the Netherlands in 2011. High- and low-performing hospitals were determined based on the overall proportion of screened patients. Descriptive statistics and analysis of variance were used to examine screening performances in relation to hospital characteristics and nursing-sensitive outcomes.

Results: Over all hospitals, the average screening rates ranged from 59% (delirium) to 94% (pain). Organizational characteristics were not different in high- and low-performing hospitals. The hospitals with the best overall screening performances had significantly better results regarding protein intake within malnourished patients ($p < .01$). For mortality, marginal significant effects did not remain after controlling for organizational structures. No associations were found with prevalence of pressure ulcers and patient self-reported pain scores.

Discussion: The screening for patient risks is an important nursing task. Our findings suggest that nursing-sensitive screening indicators may be relevant measures for benchmarking nursing quality in hospitals. Time-trend studies are required to support our findings and to further investigate relations with nursing-sensitive outcomes.

Key Words: hospitals • nurses • quality indicators • risk assessment • screening • The Netherlands

Nursing Research, September/October 2016, Vol 65, No 5, 362–370

The focus on quality and safety issues in healthcare has increased the demands for public reporting of indicator data. The purpose is to be transparent about clinical quality indicators to allow stakeholders to make comparisons between hospitals (Ketelaar et al., 2011). Moreover, such indicators are used by regulators for policy purposes and by insurance companies for compensation agreements. Quality indicator data also enable consumers to make informed choices and offer opportunities for hospital organizations to gain insight into their performances (Dubois, D'Amour, Pomey, Girard, & Brault, 2013).

Nursing-sensitive indicators, defined as those that "…capture care or its outcomes most affected by nursing care," can be used to evaluate nursing quality (Heslop & Lu, 2014; Maas, Johnson, & Moorhead, 1996). In many countries (e.g., Australia, Canada, United States, United Kingdom), efforts have been made to use nursing-sensitive indicators for national benchmarking purposes (Kurtzman, Dawson, & Johnson, 2008). For example, many U.S. hospitals voluntarily provide data to the National Database of Nursing Quality Indicators, and use of indicators such as pressure ulcers, falls, and medical errors is federally mandated in the Minimum Data Set (Wachter,

Dewi Stalpers, MSc, is a RN-ICU, St. Antonius Hospital and PhD Student, University of Utrecht, The Netherlands.

Dimitri van der Linden, PhD, is Associate Professor, Institute of Psychology, Erasmus University, Rotterdam, The Netherlands.

Marian J. Kaljouw, PhD, is Chief Executive Officer, Dutch Healthcare Authority, Utrecht, The Netherlands.

Marieke J. Schuurmans, PhD, is Professor, Department of Revalidation Nursing Science & Sports, University Medical Centre Utrecht, The Netherlands.

Supplemental digital content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's Web site (www.nursingresearchonline.com).

DOI: 10.1097/NNR.0000000000000170

Foster, & Dudley, 2008). In the Netherlands, since 2007, the Health Care Inspectorate has required hospitals to publicly report nursing-sensitive indicators defined as delirium, malnutrition, pain, and pressure ulcers (www.ziekenhuizentransparant.nl). Since October 2014, it has also been mandatory for Dutch hospitals to publicly report the hospital standardized mortality ratio (HSMR; Dutch Hospital Association, 2013).

Nurses are the largest group of healthcare professionals in hospitals, and therefore, comparative research on nursing quality and performance is highly relevant. Donabedian's (1988) structure–process–outcome framework is often used to assess the quality of nursing care. Outcome indicators refer to patient outcomes that are determined to be nursing-sensitive because they depend on the quantity or quality of nursing care. Process indicators reflect activities completed by nurses when giving care, such as performance of risk assessments and nursing interventions. Indicators of structures for nursing care involve all the factors that affect the context in which care is delivered (Mainz, 2003).

Assessment of healthcare-related risks is a main responsibility of nurses (Agency for Healthcare Research and Quality, 2008). On the basis of this statement, screening performance indicators would be particularly useful for assessment of nursing quality. Screening refers to identification of patient risk as a process indicator of quality of hospital nursing care; screening refers to how often patients' risk identification has taken place after admission to the hospital. For example, the number of patients screened for malnutrition on admission and the number of postoperative patients with standardized pain assessments are potential screening indicators of hospital nursing care quality.

Purpose

In this study, we aimed to assess nursing care quality in Dutch hospitals using performance of publicly reported nursing-sensitive screening indicators. To gain insight into factors that possibly affect these performances, we also examined associations between structural characteristics of the hospitals and performance of screening. In addition, we tested the extent to which overall screening performances were related to nursing-sensitive outcomes of care for patients.

BACKGROUND

A vast body of literature exists on quality of nursing care across structure, process, and outcome levels. There is ample evidence of associations between structural workforce characteristics (e.g., skill mix, nurse staffing) and nursing-sensitive outcomes (e.g., occurrences of pressure ulcers, patient falls). Various reviews reported positive effects of higher levels of nurse staffing (e.g., Kane, Shamliyan, Mueller, Duval, & Wilt, 2007; Lang, Hodge, Olson, Romano, & Kravitz, 2004; Lankshear, Sheldon, & Maynard, 2005; Stalpers, de Brouwer, Kaljouw, & Schuurmans, 2015). To date, there has been little evidence on structural hospital characteristics (e.g., teaching status, hospital size) in relation to nursing-sensitive outcomes. For example, only small associations were found between hospital size, university status, geographic location, and nurse-reported impression of quality of care on their nursing unit/ward (Lindqvist, Smeds Alenius, Griffiths, Runesdotter, & Tishelman, 2015). Similar results were found with regard to the association between teaching status, bed size, and potentially preventable, adverse events (Rivard, Elixhauser, Christiansen, Zhao, & Rosen, 2010). As mentioned, it is difficult to directly relate structure to outcome because process is mediating the relationship (Kramer, Schmalenberg, & Maguire, 2010).

The relationship between variations in structure and processes has been examined in previous medical studies. For example, hospital process performance regarding acute myocardial infarction, heart failure, and pneumonia has been associated with system ownership and number of specialists, but no significant associations were found for region, teaching status, and hospital size (Hines & Joshi, 2008; Ukawa, Ikai, & Imanaka, 2014). In addition, various attempts have been made to examine process performance in relation to outcomes. Significant associations were found with regard to acute myocardial infarction and mortality (Peterson et al., 2006; Popescu, Werner, Vaughan-Sarrazin, & Cram, 2009; Ukawa et al., 2014).

In nursing, these kinds of comparisons have not yet been investigated much in previous studies—especially because process indicators have not often been used to compare nursing performances in hospitals (Alexander, 2007; Dunton, Gajewski, Klaus, & Pierson, 2007). Process indicators, however, may be well suited for nursing performance assessment for several reasons: (a) evaluating hospital performance based on nursing-sensitive outcome indicators (e.g., pressure ulcer prevalence, patient fall rates) is difficult because of, for example, differential initial risks and complexity of patients, combined with a wide variation in measuring outcomes among hospitals; (b) process indicators are frequently included in large data sets and therefore quicker to obtain; and (c) process indicators are easy to interpret and sensitive to detect differences in quality of care (Rubin, Pronovost, & Diette, 2001; Van Herck et al., 2010). In particular, screening indicators could be valuable as quality measures because of nurses' responsibilities in the screening of risks (Agency for Healthcare Research and Quality, 2008; Savitz, Jones, & Bernard, 2005) and the fact that nursing screening processes should occur regardless of the conditions of patients (Mant, 2001). In addition, screening allows for early recognition and interventions in high-risk patients, which can prevent complications or other adverse events (Bolton, Donaldson, Rutledge, Bennett, & Brown, 2007). Therefore, our hypothesis was that, although screening indicators may not directly express nursing quality, they can serve as a proxy for the quality outcomes for patients, and as such, these kinds of process indicators could be used to differentiate nursing quality in hospitals.

METHODS

Design and Data Collection

The study used an observational design and was based on secondary use of data collected in 2011 for administrative and regulatory reporting purposes. The publicly reported hospital data on nursing-sensitive indicators were derived from the national database of the Dutch Health Care Inspectorate (Inspectie voor de Gezondheidszorg). The Health Care Inspectorate is responsible for supervision on the quality of healthcare in the Netherlands. The database includes the mandatory reports of quality indicators for all 93 hospitals in the Netherlands. At the end of each year, hospital management is obliged to submit data from all its units (e.g., medical, critical care, step-down) on various, previously defined healthcare indicator sets, including the set of nursing-sensitive indicators (Dutch Health Care Inspectorate, 2010). The nursing-sensitive outcome and process indicators are related to delirium, malnutrition, pain, and pressure ulcers. Nurses collect the data on a daily basis. Data are documented in hospital unit-based data management systems. In this cross-sectional study, we used the 2011 data on nursing-sensitive indicators. Children (<18 years old) and daycare patients were excluded from our analyses. The data were provided by Dutch Hospital Data (DHD), which reviewed the study protocol in accordance with the protocol "DHD-Databases Use" and with local regulations in the Netherlands (i.e., Data Protection Act). The DHD gave formal approval to conduct the study (Reference no. 12.11.21.01/PH.sdh).

Measures

Structure Variables We included hospital characteristics found to be related to quality of inpatient care (Engineer et al., 2015): (a) teaching status, (b) region, (c) patient complexity, (d) hospital size, and (e) nursing full-time equivalents (FTEs). Teaching status was categorized as nonteaching hospitals (general hospitals without teaching status), teaching hospitals (general hospitals with teaching status), and academic hospitals (university hospitals with teaching status, including a medical faculty). For region, a division was made between hospitals in urban areas (>100,000 inhabitants) and hospitals in rural areas (≤100,000 inhabitants). Patient complexity was measured by comparing high-technology and non-high-technology hospitals; high-technology hospitals were "… those that perform open-heart surgery and/or organ transplant surgery" (McHugh & Ma, 2013). The annual reports of each hospital provided us these data as well as the number of licensed beds (i.e., hospital size). Nursing FTEs was included as a nursing workforce measure. The Netherlands Federation of University Medical Centers and the Dutch Hospital Association provided us the numbers on FTEs of nurses per hospital in 2011.

Process Variables We analyzed the five mandatory screening indicators: (a) proportion of patients screened for delirium, according to the Dutch delirium guideline for adults; (b) proportion of patients observed with delirium (i.e., with positive delirium screens who were subsequently reassessed at least once using the screening instruments Delirium Observation Screening or Confusion Assessment Method); (c) proportion of patients screened for malnutrition, using the Short Nutritional Assessment Questionnaire or Malnutrition Universal Screening Tool; (d) proportion of postoperative patients in the recovery room with pain assessed, using a Visual Analogue Scale (VAS) with scores ranging from 0 = *no pain* to 10 = *worst imaginable pain*; and (e) proportion of postoperative patients in hospital units with pain assessed using the VAS pain intensity tool. Table 1 contains definitions of all indicators and related data collection methods.

Outcome Variables The following mandatory nursing-sensitive outcome indicators were used: (a) proportion of malnourished patients with an adequate protein intake, (b) prevalence of pressure ulcers, (c) severe pain after surgery (VAS > 7), and (d) HSMR (see Table 1). The HSMR was only available for 47 hospitals because it has only been mandatory to publicly report these data since 2014.

Statistical Analysis

To evaluate the robustness of the data set, we explored its stability by Pearson correlations between sets of data over 2 consecutive years: 2010 and 2011. For all other analyses, we used the most recent data set from 2011.

First, to assess screening performances in the 93 hospitals, we determined the mean percentages of patients screened for delirium, malnutrition, and pain. In addition, we categorized hospitals into high- and low-performing hospitals on the basis of multiple indicators. This is in line with a review by Taylor, Clay-Williams, Hogden, Braithwaite, and Groene (2015), emphasizing the need to analyze hospital performance on a range of indicators to give a more comprehensive picture of performances. For each of the five screening indicators, we identified the mean, the median (50th percentile), and the interquartile range (IQR). High-performing hospitals were the hospitals with the best screening performances; those hospitals without any of the screening indicators ranked in the lower quartiles. Low-performing hospitals were the hospitals with the least screening performances; those hospitals with three or more of the screening indicators ranked in the lower quartiles. All other hospitals were defined as intermediate-performing hospitals. Some hospitals did not provide data on one or more screening indicators (missing values). These hospitals were treated as nonresponders and therefore were included in the lower quartile of that specific indicator. For example, Hospital A could not report delirium-screening data, because these data were not yet available in 2011. As a result, Hospital A was put in the lower quartile of the indicator screening delirium. We used χ^2 tests for independence to

TABLE 1. Definitions of Nursing-Sensitive Indicators

Type/indicator[a]	Indicator computation[b]		Comments
	Numerator	Denominator	
Process			
Delirium screen	Units: with >80% of patients ≥ 70 years old screened	Units: with admitted patients ≥ 70 years old	Risk indicated by ≥1 positive answer • Memory problems • Help with self-care prior 24 hours • Confusion during past hospitalization/illness[c]
Delirium observation	Patients: with CAM or DOS measured at least once	Patients: at risk of delirium	• CAM (short version): sensitivity = 53%–90%, specificity = 84%–100% • DOS scale: sensitivity = 89%–100%, specificity = 88%–97%[d]
Malnutrition screen	Patients: adults screened on admission	Patients: adults admitted	• MUST: sensitivity = 73%–96%, specificity = 80%–82%[e] • SNAQ: sensitivity = 76%–88%, specificity = 83%–91%[f]
Pain assessment	• Patients/postoperative: pain assessment in RR • Patients/postoperative: pain assessment on ward	• Patients/postoperative admitted to RR • Patients/postoperative admitted to ward	• r = .71–.99 between four pain intensity scales: VAS (verbal descriptive scale), numeric rating scale (NRS), verbal descriptor scale (VDS), and the Faces Pain Scale Revised (FPS-R)[g]
Outcome			
Malnutrition treatment	• Patients/severe malnutrition with adequate protein intake on the fourth hospital day	• Patients/severe malnutrition on Day 5 during 1 of 4 sampling days	• SNAQ ≥ 3 or MUST ≥ 2: severe malnutrition • Adequate protein intake: 1.2- to 1.5-g/kg body weight[h]
Pressure ulcer	• Patients: grade 2–4 pressure ulcer or skin lesions related to incontinence	• Patients examined	• Data collection: wound counselor
Pain: severe postoperative	• Patients: severe pain, first 72 postoperative hours	• Patients assessed, at least six occasions	• VAS: scores > 7 • Data collection: nurse in internal data systems
HSMR[i]	• Patients: acute in-hospital death	• Expected in-hospital deaths, adjusted for case mix, standardized at 100	• Data collection: hospitals

Note. CAM = Confusion Assessment Method; DOS = Delirium Observation Screening; HSMR = hospital standardized mortality ratio; MUST = Malnutrition Universal Screening Tool; RR = recovery room; SNAQ = Short Nutritional Assessment Questionnaire; VAS = Visual Analogue Scale. [a]Indicators mandated by the Dutch Health Care Inspectorate (2010). [b]Frequencies based on annual numbers in 2011, except that treatment malnutrition was assessed annually on 4 sampling days and pressure ulcer prevalence was evaluated at a fixed time during the year. [c]Dutch Association of Clinical Geriatrics (2013). [d]Richtlijnen Database (n.d.; http://richtlijnendatabase.nl/). [e]Neelemaat, Meijers, Kruizenga, van Ballegooijen, and van Bokhorst-de van der Schueren (2011). [f]Kruizenga, Seidell, de Vet, Wierdsma, and van Bokhorst-de van der Schueren (2005). [g]Li, Liu, and Herr (2007). [h]Advisory Committee Undernutrition (2011). [i]Dutch Hospital Association (2013).

assess associations between hospital characteristics and overall screening performance.

Second, we used analysis of variance to identify the influence of hospital characteristics on hospital performance on each screening indicator. Normality assumptions were assessed using the Kolmogorov–Smirnov test. Then, analyses of variance with Bonferroni corrections for multiple post hoc comparisons were used to examine hospital screening performance in relation to nursing-sensitive outcomes. Follow-up tests (including adjustments for the hospital characteristics [hospital size and nursing FTEs]) were performed when the omnibus test was significant. Nominal type 1 error rate of .05 was used for follow-up tests. IBM SPSS Statistics for Windows (version 21) was used for the analyses.

RESULTS

Characteristics of the 93 hospitals are presented in the first column of Table 2. The hospitals in the Netherlands are mainly nonteaching (59%), non-high-technology (83%) hospitals, and located in rural areas (57%). Most of the hospitals are middle sized (300–600 beds, 400–800 nursing FTEs).

In the preliminary analysis comparing indicators in the data sets from 2010 and 2011, correlations showed moderate stability for all nursing-sensitive indicators, ranging from a correlation of r = .42 (prevalence pressure ulcers) to r = .67 (pain assessment units). These findings indicate that year-over-year performance was reasonably stable.

Screening Prevalence

Across the hospitals, the highest screening proportions were found for the indicators of pain, particularly pain assessment in the recovery room (M = 94%, median = 98.9%, Q1 = 90.3%, Q3 = 100%, IQR = 9.7). In contrast, delirium showed relatively low screening rates with mean values of 58.5% for observation of delirium and 64.9% for screening of delirium. Furthermore, large variation was found between the lower and upper quartiles of these screening indicators of delirium; for screening delirium, Q1 was 39.6%, and Q3 was 100%

TABLE 2. Hospital Characteristics: All Hospitals and by Performance Level

	All (*N* = 93)		High (*n* = 23)		Intermediate (*n* = 53)		Low (*n* = 17)		
Characteristic	***n***	**(%)**	***n***	**(%)**	***n***	**(%)**	***n***	**(%)**	***p*[a]**
Teaching status									.63
Academic	8	(8.6)	1	(4.3)	6	(11.3)	1	(5.9)	
Teaching	30	(32.3)	10	(43.5)	15	(28.3)	5	(29.4)	
Nonteaching	55	(59.1)	12	(52.2)	32	(60.4)	11	(64.7)	
Region									.31
Urban	40	(43.0)	13	(56.5)	21	(39.6)	6	(35.3)	
Rural	53	(57.0)	10	(43.5)	32	(60.4)	11	(64.7)	
Complexity									.99
High technology	16	(17.2)	4	(17.4)	9	(17.0)	3	(17.6)	
Non-high technology	77	(82.8)	19	(82.6)	44	(83.0)	14	(82.4)	
Hospital beds									.25
<300	28	(30.1)	4	(17.4)	18	(34.0)	6	(35.3)	
300–600	36	(38.7)	13	(56.5)	19	(35.8)	4	(23.5)	
>600	29	(31.2)	6	(26.1)	16	(30.2)	7	(41.2)	
Nursing FTE[b]									.36
<400	29	(31.2)	8	(38.1)	17	(35.4)	4	(33.3)	
400–800	31	(33.3)	6	(28.6)	22	(45.8)	3	(25.0)	
>800	21	(22.6)	7	(33.3)	9	(18.8)	5	(41.7)	

Note. FTE = full-time equivalent. [a]χ^2 test for independence. [b]Missing for 12 hospitals.

(IQR = 60.4), and for observation of delirium, Q1 was 32.9%, and Q3 was 83.8% (IQR = 50.9). The mean value of screening of malnutrition was a little over 77% (median = 80.9%, Q1 = 67.6%, Q3 = 88.1%, IQR = 20.5).

Associations With Hospital Characteristics

On the basis of the criterion of having none of the individual screening indicators ranked in the lower quartiles, 23 hospitals were labeled as high-performing hospitals. There were 53 intermediate-performing hospitals, and 17 hospitals were coded as low-performing hospitals. In Table 2, it is shown that the hospital characteristics (teaching status, region, complexity, beds, nursing FTEs) were not statistically associated with overall screening performance (high, intermediate, or low).

Table 3 reveals the associations between prevalence for each process indicator (delirium screening, delirium observations [refers to the number of patients with initial positive screens who are observed at least once more using the Delirium Observation Screening or Confusion Assessment Method], malnutrition screens, pain assessment in the recovery room, and hospital unit) and hospital characteristics. Hospitals with the lowest number of FTEs (<400) had the highest proportion of patients screened for delirium ($p < .05$). Teaching hospitals had the most favorable screening performances for pain assessment in hospital units ($p < .05$). A positive trend was found for teaching hospitals in relation to the screening of malnutrition ($p < .07$).

Relationships With Nursing-Sensitive Outcomes

Table 4 reports that there was a significant positive association between overall screening performance and the outcome of protein intake ($p < .05$); a higher proportion of malnourished patients had an adequate protein intake in high-performing hospitals, as compared with low-performing and intermediate-performing hospitals. Post hoc analysis confirmed the differences between the highest- and lowest-performing hospitals regarding protein intake by showing that the associations remained after adjusting for hospital characteristics ($F(2,74) = 5.51$, $p < .01$, $\eta^2 = .13$). In addition, mortality trended lower in high-performing hospitals ($p < .09$); however, the trend was not apparent after adjusting for hospital characteristics. Because HSMR was available for only a subset of hospitals, we examined associations between availability of HSMR and nursing-sensitive indicators; there were no statistically significant associations with process indicators, treatment of malnutrition, or severe pain, but prevalence of pressure ulcers was higher in hospitals that did not report HSMR. Details are available (see Table, Supplemental Digital Content 1, http://links.lww.com/NRES/A181).

DISCUSSION

Measurement of quality of nursing care by the use of screening indicators is relevant and useful, because these indicators reflect nurses' responsibilities toward assessments of healthcare-related risks and subsequent interventions. Previous research on the relationship with outcomes is limited. On the basis of analyses of nursing-sensitive screening data, including all 93 hospitals in the Netherlands, our data showed that hospitals with the best overall screening performance also had the best achievement regarding protein intake in

TABLE 3. Screening Indicators by Hospital Characteristics

	Delirium screening ($n = 76$)			Delirium observation[a] ($n = 70$)			Malnutrition screening ($n = 93$)			Pain assessment recovery room ($n = 93$)			Pain assessment hospital unit ($n = 91$)		
Characteristic	***M***	**(*SD*)**	***p***	***M***	**(*SD*)**	***p***	***M***	**(*SD*)**	***p***	***M***	**(*SD*)**	***p***	***M***	**(*SD*)**	***p***
Teaching status			.22			.49			.07			.44			.05
Academic	58.6	(23.3)		48.6	(26.3)		69.4	(21.9)		96.3	(7.2)		70.7	(10.6)	
Teaching	57.3	(33.1)		63.3	(26.3)		81.6	(13.2)		95.0	(6.1)		85.2	(13.9)	
Nonteaching	70.5	(32.5)		57.1	(30.9)		76.0	(14.2)		92.7	(11.3)		77.2	(16.5)	
Region			.82			.42			.37			.29			.22
Urban	63.9	(28.6)		61.7	(28.2)		78.8	(14.7)		95.0	(10.0)		81.7	(15.4)	
Rural	65.7	(35.0)		56.1	(29.6)		76.0	(15.1)		92.8	(9.3)		77.6	(16.0)	
Complexity			.31			.87			.40			.14			.40
High technology	57.2	(25.5)		57.2	(31.3)		74.4	(18.6)		97.0	(5.7)		76.2	(15.2)	
Non-high technology	66.8	(33.5)		58.8	(28.8)		77.8	(14.1)		93.1	(10.1)		80.0	(15.9)	
Hospital beds			.12			.18			.89			.37			.65
<300	73.6	(27.6)		49.0	(32.7)		76.1	(16.6)		91.8	(10.4)		78.1	(14.8)	
300–600	66.7	(34.3)		64.4	(27.2)		77.9	(12.0)		93.9	(11.0)		78.5	(16.9)	
>600	54.2	(31.5)		59.0	(26.3)		77.4	(16.8)		95.4	(6.4)		81.7	(15.5)	
Nursing FTE*			.05			.35			.91			.79			.98
<400	80.7	(24.5)		54.0	(31.0)		79.2	(14.1)		92.2	(10.2)		81.3	(15.4)	
400–800	50.0	(34.8)		60.0	(28.5)		77.6	(12.2)		93.6	(11.1)		80.7	(14.1)	
>800	65.1	(28.1)		67.8	(24.5)		78.7	(16.8)		94.1	(7.1)		81.6	(16.7)	

Note. Entries are mean percentages and *SD*s for percentages. *p*-values are for ANOVA results. FTE = full-time equivalent. [a]Refers to patients with an initial positive screen for delirium who are observed at least once more using the Delirium Observation Method or Confusion Assessment Method.

TABLE 4. Hospital Performance by Screening Indicators and Relation With Nursing-Sensitive Outcomes

	Adequate protein ($n = 90$)			Severe pain[a] ($n = 91$)			Pressure ulcer ($n = 93$)			HSMR ($n = 47$)		
Performance	***M***	**Min**	**Max**	***M***	**Min**	**Max**	***M***	**Min**	**Max**	***M***	**Min**	**Max**
Low	35.5	23.4	47.6	6.5	4.2	8.9	3.6	2.5	4.7	106.2	98.0	114.5
Intermediate	44.9	39.1	50.7	7.1	6.1	8.1	3.0	2.4	3.5	97.6	92.4	102.8
High	53.5	43.3	63.8	6.0	4.3	7.7	3.0	2.2	3.8	91.9	79.9	103.9
p	.05			.50			.46			.09		

Note. Entries are mean prevalence for adequate protein intake, severe pain, and pressure ulcers and mean mortality ratio for HSMR. HSMR = hospital standardized mortality ratio; Max = maximum; Min = minimum; VAS = Visual Analogue Scale.[a]VAS > 7.

malnourished patients. For mortality, initial differences between hospitals disappeared after controlling for organizational structures of the hospitals. These findings partially confirm our hypothesis that the easier-to-measure screening indicators can be predictors of the outcomes of nursing care for patients. This is because we did not find significant associations with the other included nursing-sensitive outcomes (i.e., pain score and pressure ulcer prevalence). To the best of our knowledge, this is one of the first scientific endeavors to assess quality of nursing care in hospitals based on process indicators instead of outcome indicators. Investigations of time trends and performances over a longer period are required to show causality of the relations.

For mortality, initial differences between hospitals disappeared after controlling for organizational structures of the hospitals.

An important finding was that relevant differences exist in how the full population of Dutch hospitals, including approximately 1.7 million admissions in 2011 (DHD, 2013), scored on a range of nursing-sensitive screening indicators. With regard to the screening indicators of delirium and malnutrition, we reported low-screening proportions, as opposed to the high number of patients screened for pain. Internationally, delirium and malnutrition are not regularly used for benchmarking purposes, but in the Netherlands, the Healthcare Inspectorate determined that these indicators could be used as measures of nursing care quality. There is much debate about the degree to which some indicators, such as delirium and malnutrition, are sensitive to nursing care. Arend and Christensen (2009), in their review on the presence and effects of delirium in intensive care units, concluded that routine screening of all patients is essential for preventing and managing delirium. An international study on nutritional status in nursing homes in Austria, Switzerland, and the Netherlands acknowledged the important role of nurses in screening and intervening to counter malnutrition (Halfens et al., 2013). On the basis of our findings, it is worth reconsidering the value of these specific indicators in evaluating nursing quality, and therefore, further empirical studies to determine the nurse sensitivity of quality indicators are required.

A relevant consideration in the debates on assessing quality is whether nursing quality is indeed lower in some hospitals compared with other hospitals or whether differences are a reflection of hospital organizational characteristics. In the medical literature, evidence has been found for associations between hospital performance on a combined set of medical process indicators and various hospital characteristics (Hines & Joshi, 2008; Ukawa et al., 2014). In our analyses, we used similar hospital characteristics (e.g., teaching status, hospital size, FTE); however, we were not able to show significant associations between the overall performance of screening indicators in hospitals and the hospital characteristics we studied. In line with results from a study on patient safety indicators (Rivard et al., 2010), we also only found relevant relationships with some individual nursing-sensitive screening indicators. This implies that, besides organizational characteristics, other factors such as characteristics of nursing may be important with regard to nurses' screening performances. For example, a recent study on screening for malnutrition in Dutch hospitals between 2007 and 2010 showed that nursing factors such as high workload and lack of engagement were important in relation to screening rates (Leistra et al., 2014). Nursing leadership styles and autonomy, found to be relevant in relation to nursing practices and decision-making processes (Weston, 2010), may be at play. Hence, it is necessary to understand where breakdowns in nursing care occur. Further empirical research should be performed to assess nursing factors in relation to screening performances of nurses.

Strengths and Limitations

The full population of hospitals in the Netherlands was included, thereby reducing potential bias from nonmotivated hospitals. A disadvantage is that the data were self-reported by hospitals, which potentially may have led to underestimation

of the real effects. Longitudinal follow-up studies are necessary to find causal links between screening activities and nursing-sensitive patient outcomes.

Although Dutch hospitals are obliged to publicly report all of the nursing-sensitive indicators, there was some missing data that prevented us from extracting a composite index for each hospital. Underreporting is a known phenomenon, which is difficult to counter and can cause bias (Van Herck et al., 2010). However, the mandatory character of the data set achieves more participation compared with voluntary public reporting systems. In contrast to previous studies that focused on one specific indicator (e.g., Leistra et al., 2014), we determined high- and low-performing hospitals on a wide range of screening indicators, enabling us to make statements about the total screening performances of hospitals. Future research using patient-level data, in addition to the hospital-level data used in this study, is necessary to increase knowledge on associations with patient characteristics.

It is difficult to compare our results with international research, as some of the publicly reported indicators in the Netherlands (i.e., delirium and malnutrition) are not mandatory to report in other countries. In line with this, data on nurse characteristics, such as the educational background of nurses, were not available for all hospitals. This is because formal function differentiation has not yet been introduced in the Netherlands, and nurses of all educational levels (bachelor's and associate's degrees) basically perform the same work activities. Future research should focus on examining screening performances in relation to nurse characteristics.

Conclusions

Nursing-sensitive screening indicators are increasingly relevant as they offer opportunities to differentiate desirable versus less desirable quality of care provided by nurses—the only healthcare professionals at a patient's bedside 24 hours a day. In this study, we have shown that hospitals with high performances regarding nursing screening processes did not differ from low-performing hospitals in terms of organizational characteristics. However, in relation to patient outcomes, hospitals with the highest proportions of screened patients had significantly more favorable results regarding protein intake in malnourished patients and mortality rates, as compared with hospitals with lower screening proportions. This study provides another step in research on nursing-sensitive screening indicators as measures to benchmark nursing quality in hospitals, by showing that overall screening processes could be predictive for nursing-sensitive outcomes for patients. There is no time for "merely rating" the delivered quality of care; rather, nursing-sensitive screening indicators should be used for "truly indicating" the provided nursing care.

Accepted for publication March 17, 2016.

The authors declare no conflicts of interest.

Corresponding author: Dewi Stalpers, MSc, RN-ICU, St. Antonius Hospital, P.O. Box 2500, 3430 EM Nieuwegein, The Netherlands (e-mail: d.stalpers@antoniusziekenhuis.nl).

REFERENCES

Advisory Committee Undernutrition. (2011). *Richtlijn screening en behandeling van ondervoeding [Guideline for screening and treatment of undernutrition]*. Retrieved from http://www.stuurgroepondervoeding.nl/wp-content/uploads/2015/02/Richtlijn_screenen_en_behandeling_van_ondervoeding_juni_2011.pdf

Agency for Healthcare Research and Quality. (2008). *Patient safety and quality: An evidence-based handbook for nurses* (Publication no. 08-0043). Rockville, MD: Author.

Alexander, G. R. (2007). Nursing sensitive databases: Their existence, challenges, and importance. *Medical Care Research and Review*, *64*, 44S–63S. doi:10.1177/1077558707299244

Arend, E., & Christensen, M. (2009). Delirium in the intensive care unit: A review. *Nursing in Critical Care*, *14*, 145–154. doi:10.1111/j.1478-5153.2008.00324.x

Bolton, L. B., Donaldson, N. E., Rutledge, D. N., Bennett, C., & Brown, D. S. (2007). The impact of nursing interventions: Overview of effective interventions, outcomes, measures, and priorities for future research. *Medical Care Research and Review*, *64*, 123S–143S. doi:10.1177/1077558707299248

Donabedian, A. (1988). The quality of care. How can it be assessed? *Journal of the American Medical Association*, *260*, 1743–1748. doi:10.1001/jama.1988.03410120089033

Dubois, C.-A., D'Amour, D., Pomey, M.-P., Girard, F., & Brault, I. (2013). Conceptualizing performance of nursing care as a prerequisite for better measurement: A systematic and interpretive review. *BMC Nursing*, *12*, 7. doi:10.1186/1472-6955-12-7

Dunton, N., Gajewski, B., Klaus, S., & Pierson, B. (2007). The relationship of nursing workforce characteristics to patient outcomes. *Online Journal of Issues in Nursing*, *12*(3), Manuscript 3. doi:10.3912/OJIN.Vol12No03Man03

Dutch Association of Clinical Geriatrics. (2013). *Guideline delirium adults 2013*. Retrieved from http://www.nvkg.nl/uploads/bB/zw/bBzw0YCHaGtVRSwyW-epTw/Richtlijn-Delier-Volwassenen-voor-autorisatie.pdf

Dutch Health Care Inspectorate. (2010). *Kwaliteitsindicatoren: Basisset ziekenhuizen 2011 [Quality indicators: Basic dataset hospitals 2011]*. Utrecht, The Netherlands: Author.

Dutch Hospital Data. (2013). *Kengetallen Nederlandse ziekenhuizen 2011 [Key figures Dutch hospitals 2011]*. Retrieved from https://www.nvz-ziekenhuizen.nl/_library/8221/

Dutch Hospital Association. (2013). *Kwaliteitsvenster [Quality window]*. Retrieved from https://www.nvz-kwaliteitsvenster.nl/ziekenhuizen

Engineer, L. D., Winters, B. D., Weston, C. M., Zhang, A., Sharma, R., Bass, E., . . . Dy, S. M. (2015). Hospital characteristics and the Agency for Healthcare Research and Quality Inpatient Quality Indicators: A systematic review. *Journal for Healthcare Quality*. Advance online publication. doi: 10.1097/JHQ.0000000000000015

Halfens, R. J., Meesterberends, E., van Nie-Visser, N. C., Lohrmann, C., Schönherr, S., Meijers, J. M., . . . Schols, J. M. (2013). International prevalence measurement of care problems: Results. *Journal of Advanced Nursing*, *69*, e5–e17. doi:10.1111/jan.12189

Heslop, L., & Lu, S. (2014). Nursing-sensitive indicators: A concept analysis. *Journal of Advanced Nursing*, *70*, 2469–2482. doi:10.1111/jan.12503

Hines, S., & Joshi, M. S. (2008). Variation in quality of care within health systems. *Joint Commission Journal on Quality and Patient Safety*, *34*, 326–332.

Kane, R. L., Shamliyan, T., Mueller, C., Duval, S., & Wilt, T. J. (2007). The association of registered nurse staffing levels and patient outcomes: Systematic review and meta-analysis. *Medical Care*, *45*, 1195–1204. doi:10.1097/MLR.0b013e3181468ca3

Ketelaar, N. A., Faber, M. J., Flottorp, S., Rygh, L. H., Deane, K. H., & Eccles, M. P. (2011). Public release of performance data in changing the behaviour of healthcare consumers, professionals or organisations. *Cochrane Database of Systematic Reviews*, (11), CD004538.

Kramer, M., Schmalenberg, C., & Maguire, P. (2010). Nine structures and leadership essential for a magnetic (healthy) work environment. *Nursing Administration Quarterly*, *34*, 4–17. doi:10.1097/NAQ.0b013e3181c95ef4

Kruizenga, H. M., Seidell, J. C., de Vet, H. C., Wierdsma, N. J., & van Bokhorst-de van der Schueren, M. A. (2005). Development and validation of a hospital screening tool for malnutrition: The short nutritional assessment questionnaire (SNAQ). *Clinical Nutrition*, *24*, 75–82. doi: 10.1016/j.clnu.2004.07.015

Kurtzman, E. T., Dawson, E. M., & Johnson, J. E. (2008). The current state of nursing performance measurement, public reporting, and value-based purchasing. *Policy, Politics & Nursing Practice*, *9*, 181–191. doi:10.1177/1527154408323042

Lang, T. A., Hodge, M., Olson, V., Romano, P. S., & Kravitz, R. L. (2004). Nurse–patient ratios: A systematic review on the effects of nurse staffing on patient, nurse employee, and hospital outcomes. *Journal of Nursing Administration*, *34*, 326–337.

Lankshear, A. J., Sheldon, T. A., & Maynard, A. (2005). Nurse staffing and healthcare outcomes: A systematic review of the international research evidence. *Advances in Nursing Science*, *28*, 163–174.

Leistra, E., van Bokhorst-de van der Schueren, M. A., Visser, M., van der Hout, A., Langius, J. A., & Kruizenga, H. M. (2014). Systematic screening for undernutrition in hospitals: Predictive factors for success. *Clinical Nutrition*, *33*, 495–501. doi:10.1016/j.clnu.2013.07.005

Li, L., Liu, X., & Herr, K. (2007). Postoperative pain intensity assessment: A comparison of four scales in Chinese adults. *Pain Medicine*, *8*, 223–234.

Lindqvist, R., Smeds Alenius, L., Griffiths, P., Runesdotter, S., & Tishelman, C. (2015). Structural characteristics of hospitals and nurse-reported care quality, work environment, burnout and leaving intentions. *Journal of Nursing Management*, *23*, 263–274. doi:10.1111/jonm.12123

Maas, M. L., Johnson, M., & Moorhead, S. (1996). Classifying nursing-sensitive patient outcomes. *Image*, *28*, 295–302. doi:10.1111/j.1547-5069.1996.tb00377.x

Mainz, J. (2003). Defining and classifying clinical indicators for quality improvement. *International Journal for Quality in Health Care*, *15*, 523–530. doi:10.1093/intqhc/mzg081

Mant, J. (2001). Process versus outcome indicators in the assessment of quality in health care. *International Journal for Quality in Health Care*, *13*, 475–480. http://intqhc.oxfordjournals.org/content/intqhc/13/6/475.full.pdf

McHugh, M. D., & Ma, C. (2013). Hospital nursing and 30-day readmissions among Medicare patients with heart failure, acute myocardial infarction, and pneumonia. *Medical Care*, *51*, 52–59. doi:10.1097/MLR.0b013e3182763284

Neelemaat, F., Meijers, J., Kruizenga, H., van Ballegooijen, H., & van Bokhorst-de van der Schueren, M. (2011). Comparison of five malnutrition screening tools in one hospital inpatient sample. *Journal of Clinical Nursing*, *20*, 2144–2152. doi:10.1111/j.1365-2702.2010.03667.x.

Peterson, E. D., Roe, M. T., Mulgund, J., DeLong, E. R., Lytle, B. L., Brindis, R. G., … Ohman, E. M. (2006). Association between hospital process performance and outcomes among patients with acute coronary syndromes. *Journal of the American Medical Association*, *295*, 1912–1920. doi:10.1001/jama.295.16.1912

Popescu, I., Werner, R. M., Vaughan-Sarrazin, M. S., & Cram, P. (2009). Characteristics and outcomes of America's lowest-performing hospitals: An analysis of acute myocardial infarction hospital care in the United States. *Circulation*, *2*, 221–227. doi:10.1161/CIRCOUTCOMES.108.813790

Richtlijnen Database. (n.d.). *Guideline database*. Retrieved from http://richtlijnendatabase.nl/richtlijn/delier_bij_volwassenen/meetinstrumenten_voor_diagnose_delier.html#onderbouwing

Rivard, P. E., Elixhauser, A., Christiansen, C. L., Zhao, S., & Rosen, A. K. (2010). Testing the association between patient safety indicators and hospital structural characteristics in VA and nonfederal hospitals. *Medical Care Research and Review*, *67*, 321–341 doi:10.1177/1077558709347378

Rubin, H. R., Pronovost, P., & Diette, G. B. (2001). The advantages and disadvantages of process-based measures of health care quality. *International Journal for Quality in Health Care*, *13*, 469–474. doi:10.1093/intqhc/13.6.469

Savitz, L. A., Jones, C. B., & Bernard, S. (2005). Quality indicators sensitive to nurse staffing in acute care settings. In K. Henriksen, J. B. Battles, E. S. Marks, & D. I. Luwin (Eds.), *Advances in patient safety: From research to implementation* (pp. 375–385). Rockville, MD: Agency for Healthcare Research and Quality.

Stalpers, D., de Brouwer, B. J., Kaljouw, M. J., & Schuurmans, M. J. (2015). Associations between characteristics of the nurse work environment and five nurse-sensitive patient outcomes in hospitals: A systematic review of literature. *International Journal of Nursing Studies*, *52*, 817–835. doi:10.1016/j.ijnurstu.2015.01.005

Taylor, N., Clay-Williams, R., Hogden, E., Braithwaite, J., & Groene, O. (2015). High performing hospitals: A qualitative systematic review of associated factors and practical strategies for improvement. *BMC Health Services Research*, *15*, 244. doi:10.1186/s12913-015-0879-z

Ukawa, N., Ikai, H., & Imanaka, Y. (2014). Trends in hospital performance in acute myocardial infarction care: A retrospective longitudinal study in Japan. *International Journal for Quality in Health Care*, *26*, 516–523. doi:10.1093/intqhc/mzu073

Van Herck, P., De Smedt, D., Annemans, L., Remmen, R., Rosenthal, M. B., & Sermeus, W. (2010). Systematic review: Effects, design choices, and context of pay-for-performance in health care. *BMC Health Services Research*, *10*, 247. doi:10.1186/1472-6963-10-247

Wachter, R. M., Foster, N. E., & Dudley, R. A. (2008). Medicare's decision to withhold payment for hospital errors: The devil is in the details. *Joint Commission Journal on Quality and Patient Safety*, *34*, 116–123.

Weston, M. J. (2010). Strategies for enhancing autonomy and control over nursing practice. *Online Journal of Issues in Nursing*, *15*, Manuscript 2. doi: 10.3912/OJIN.Vol15No01Man02