



Patient readiness for hospital discharge and its relationship to discharge preparation and structural factors: A cross-sectional study

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ABSTRACT

Background: Nursing discharge preparation is vital to successful hospital-to-home transitions. However, despite a wealth of evidence on its effectiveness, little is known of the structure- and process-related factors that facilitate or impede its use in clinical practice. Specifically, the associations between unit size and type, leadership support, skill mix, staffing, nurse and patient characteristics, discharge teaching and patient readiness for discharge have rarely been studied.

Objectives: This study aimed to explore the associations between structure-individual characteristics (i.e., unit, nurse and patient characteristics) and process-related (i.e., teaching of self-care and symptom management) factors and patient readiness for hospital discharge.

Design: A secondary data analysis of the multicentre observational “Matching Registered Nurse services with changing care demands (Match^{RN})” study.

Setting and period: Data were collected between September 2015 and January 2016 on 123 surgical, medical and mixed units in 23 Swiss acute care hospitals.

Participants: A total of 1833 registered nurses and 1755 patients were included in the analyses.

Methods: Structure-, process- and patient readiness-related hospital discharge variables were assessed using validated items either from existing instruments or self-developed. Multilevel mixed-effects logistic regression was used to test associations.

Results: Fewer than half of the patients hospitalized (47.8%) reported readiness for hospital discharge. Fifty-eight percent reported receiving discharge preparation interventions for self-care and 30% for symptom management. Patients’ readiness for hospital discharge was significantly lower in larger units ($\beta = -0.001$; 95% confidence interval (CI) = -0.002 to -0.001) and on medical units ($\beta = -0.44$; 95% CI = -0.70 to -0.19). Higher nurses’ experience ($\beta = .004$; 95% CI = 0.001 to 0.01), better patient self-reported health ($\beta = -0.11$; 95% CI = -0.17 to -0.05), higher patient ratings of self-care teaching ($\beta = 1.33$; 95% CI = 1.07 – 1.59) and symptom management teaching ($\beta = 0.79$; 95% CI = 0.52 – 1.06) were significantly associated with greater patient readiness for hospital discharge.

Conclusions: Patient readiness for hospital discharge is associated with process- and structure-related factors. Our findings suggest that, for successful uptake in clinical practice, the development and implementation of effective discharge preparation programs should consider the structural context, i.e., patient population, unit size, and experience of nurses within the team. Further research, using a more accurate measure of patient readiness for hospital discharge, is needed to test associations with the nurse work environment and staffing.

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What is already known about the topic?

- Discharge preparation is a valuable nursing intervention for the successful transition from hospital to home.
- Readiness for hospital discharge correlates positively with nursing discharge preparation.
- Adequate nurse staffing increases patient readiness for hospital discharge rates.

What this paper adds

- Patient readiness for hospital discharge decreases with larger unit size and is lower in medical units.
- Organizational contextual factors such as leadership and support, staffing and skill mix levels were not associated with patients' perceptions of discharge readiness.
- More experienced nurses and patient perception of discharge preparation regarding teaching of self-care and symptom management were associated with higher patient readiness for hospital discharge.

1. Introduction

The value of nursing discharge preparation is well known for patient transitions from hospital to home (Naylor et al., 2011). Optimally, it ensures seamless continuity of care to meet patients' post-discharge needs, thereby avoiding re-hospitalization (Coleman et al., 2006). As a process, discharge preparation encompasses three key components: (1) assessment and planning of discharge needs, including assessment of the readmission risk; (2) discharge teaching (educational interventions); and (3) discharge coordination (arrangements for any necessary post-discharge support) (Weiss et al., 2015). Nurses perform many of the core care activities aimed at discharge preparation.

Strangely, the hospital context, or more precisely, certain structures and processes, can actually impede the realization of successful nursing discharge preparation. A meta-analysis of the effectiveness of nursing discharge planning interventions on health-related outcomes for older inpatients discharged home had different results by country. Authors suggest that there may be a link with the structure and organization of the discharge preparation of each country (Mabire et al., 2018). Other studies have shown that when nurses work in inadequately staffed environments, for example, the delivery of nursing discharge preparation is hampered (McHugh et al., 2013; Nosbusch et al., 2011). In addition to overwhelming workloads, deficiencies regarding nurses' autonomy, interdisciplinary relationships, managerial support, resources, and integration in decision making processes on the ward can all lead to disruptions of patient discharge preparation. Struggling to perform even the highest-priority nursing duties, i.e., forced to ration their care, nurses are more likely to leave this vital work undone (Ausserhofer et al., 2014; McHugh et al., 2013; Schubert et al., 2013).

Previous studies revealed that discharge preparation was left undone by 58% of nurses in a Michigan hospital (Kalisch et al., 2009), while a study in Pennsylvania revealed that on average 12% of nurses across 168 hospitals reported that preparation of patients and families for discharge was missed (Lucero et al., 2010). In another study, more than one-third (35%) of nurses were not confident that patients could manage their own care after hospital discharge (Aiken et al., 2012). In Switzerland, 16.4% of patients and families felt inadequately prepared for discharge, 38.3% of nurses failed to develop or update nursing care plans and

30.9% were unable to educate patients and their families (Ausserhofer et al., 2014). Our previous work in Switzerland found that nurses gave inadequate attention to discharge preparation, with only one-third of older patients in medical units receiving nursing discharge teaching interventions (Mabire et al., 2015a,b).

The literature describes several structure- and process-related factors and their impacts on patient discharge preparation. Weiss et al. (2011) demonstrated a positive association between the number of hours during which nurses were available to patients during hospitalization, higher quality of patient-reported discharge teaching and lower subsequent readmission rates. With more care time allocated per patient day, nurses can invest more hours in time-consuming activities such as discharge preparation. It has long been known that understaffing, poor communication and pressure to discharge patients quickly contributes to inappropriate discharge preparation (Anthony and Hudson-Barr, 1998; Bowles et al., 2003). Conversely, other research has correlated negative nurse work environment factors (e.g., understaffing) with poor discharge preparation and higher readmission rates (Carthon et al., 2015; Lasater and McHugh, 2016; Ma et al., 2015; Mistiaen et al., 2007). Jha et al. (2009) reported more thorough discharge preparation in smaller hospitals and in those with higher nurse-to-patient-day ratios.

Another factor linking staffing structures with hospital patient outcomes is nurse characteristics (Aiken et al., 2011, 2014; Needleman et al., 2011). For instance, the number and skill mix of nurses (e.g., the numbers with Associate degrees, Bachelors of Science in Nursing, or advanced practice designations) is crucial to plan, organize, direct and provide the care and services required by complex patients (Krichbaum et al., 2007).

Patient-reported readiness for discharge is a widely-used outcome metric of the discharge preparation process and a predictor of readmission risk (Weiss et al., 2014). Characterized as "a complex multidimensional, multiphase phenomenon that provides an estimate of a person's ability to leave the hospital (Bobay et al., 2010), patient readiness for hospital discharge correlates positively with the quality of discharge teaching (Weiss et al., 2007). Patients and their family caregivers often perceive that they are not adequately prepared for discharge and have attributed post-discharge problems to their unmet information needs (Driscoll, 2000; Henderson and Zernike, 2001).

Research generally supports the efficacy of discharge preparation interventions, but findings are mixed, particularly when interventions are translated to clinical settings (McHugh and Ma, 2013). Resolving this translational difficulty will require a clearer understanding of structure- and process-related factors that facilitate or impede nursing discharge preparation and patients' readiness for discharge. Therefore, with this study we aimed to explore the associations between structure-individual characteristics (i.e., unit, nurse and patient characteristics) and process-related (i.e., teaching of self-care and symptom management) factors and patient readiness for hospital discharge.

2. Conceptual framework

This study was informed by the Quality of medical care Model from Donabedian's (2005) classic structure, process and outcome concepts in the theory of quality care relationships. Our specific model was adapted to the context of research on discharge preparation, and describes relationships with unit characteristics, organizational context, nurse characteristics, patient perception of discharge preparation processes and patient readiness for hospital discharge (Fig. 1).

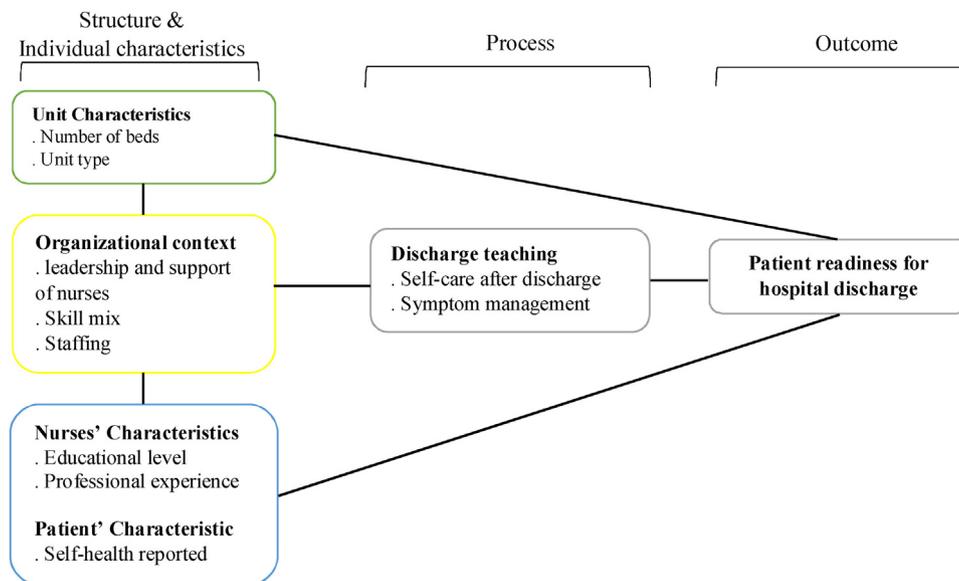


Fig. 1. Conceptual model (Donabedian, 2005).

3. Methods

3.1. Study design, setting and sample

This is a secondary data analysis of the multi-centred, cross-sectional, multilevel “Matching Registered Nurse services with changing care demands (Match^{RN})” study design with data collected at the hospital, unit, nurse and patient levels (Bachnick et al., 2017).

A survey was distributed to medical, surgical and mixed Swiss acute care hospital units across the country’s three (German, French and Italian) language regions. All registered nurses involved in direct care were asked to complete the survey. Patients hospitalised on these units at the time of data collection were invited to participate if they fulfilled the following inclusion criteria: aged 18 years or older; sufficiently healthy to participate; hospitalized at least 48 h; good understanding of German, French or Italian language; not having previously completed the questionnaire.

3.2. Data sources, variables and measurements

The Match^{RN} survey is based on the RN4CAST survey (Sermeus et al., 2011), with modified scales and additional items. The scales have undergone validity and reliability testing and have been used successfully in previous national and international outcome studies (Aiken et al., 2002; Sermeus et al., 2011). Details of the Match^{RN} survey methodology are reported elsewhere (Bachnick et al., 2017). In brief, the nurse survey contained over 177 items across 15 different scales, the patient survey 37 items from five scales, and the unit survey 9 items on a single scale.

3.2.1. Outcome variable

The outcome variable of patient readiness for hospital discharge was evaluated by a single item: “Did you perceive that the institution prepared you for the time after the treatment was finished?”. The answer options ranged from 1 (‘absolutely not’) to 5 (‘very large extend’), with additional answer option “I don’t know.” We dichotomized the responses as feeling prepared (4 and 5) or not prepared (1–3). Responses of “I don’t know” were treated as missing data.

3.2.2. Explanatory variables

Patient perception of discharge teaching was evaluated via two items from the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey (AHRQ). Of these, one was related to self-care: “During this hospital stay, have physicians, nursing staff or any other caregivers told you about the necessary care after hospital discharge?” Another was related to post-discharge symptom management: “During this hospital stay, have you received written information regarding symptoms or health problems that you will need to be aware of when you leave the hospital?” Each of these items had three answer options: yes, no, or not necessary. Not necessary answers were treated as no response, because in this case patient didn’t received discharge teaching intervention.

3.2.3. Control variables

To describe the hospital sample, single items related to institutional type (teaching status, general or district hospital) and language region (German, French or Italian) were included in the hospital survey. Two items from the self-developed unit survey gathered data on each participating unit’s size (number of beds) and type (medical, surgical or mixed).

Nurses provided information on their age (in years), gender (male/female), professional experience (years), percentage of employment, and educational background (bachelor’s degree or not), which we used to create a unit-level measure of the percentage of nurses with Bachelors of Science in Nursing degrees and their number of years of professional experience (Aiken et al., 2003).

Organizational context was described based on reports of leadership and support, skill mix and staffing. Leadership and support elements were assessed using a 5-item Leadership and Support of Nurses subscale extracted from the 32-question Practice Environment Scale, Nursing Work Index–Revised (PES–NWI–R) (Lake, 2002). Each scale item includes four Likert-type answer options ranging from 1 (strongly disagree) to 4 (strongly agree). Staffing and skill mix were measured with a set of self-developed items on the total numbers of patients and licensed/registered nurses on the most recent shift worked. These items have been the basis of several landmark studies in the field, including the RN4CAST study (Aiken et al., 2002, 2014). Staffing

level was calculated as the ratio of the total number of patients to the total number of registered nurses working on the unit during the respondents' most recent shift. Skill mix was computed as the percentage of registered nurses among the total number of nurses working on the most recent shift.

Patient self-rated functional health status was assessed with the EuroQol-5 Dimension-3 Level (EQ-5D-3L) scale. The EQ-5D-3L's five dimensions are mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each item presents three answer options: 1 (no problems); 2 (some problems); and 3 (extreme/debilitating problems). A total score for each patient was calculated by adding the result of the 5 items. Scores are indexed with consideration for age and gender to indicate the extent to which a health problem exists on each dimension. Our patient survey also included three elements of demographic information: age (year), gender (male/female), and education level (nor graduation to university degree).

3.2.4. Survey translation and validity testing

The extracted scales and items were originally composed in English. As they were not available in German, French or Italian, they were translated into German using a modified Brislin protocol, a systematic translation process (Jones et al., 2001). The details of the translation and validation processes have been previously described (Bachnick et al., 2017).

3.3. Data collection and analysis

Between September 2015 and January 2016, all participating hospitals and units received and completed the questionnaires. Nurses on the respective units identified and recruited eligible patients, while hospital and unit managers collected administrative data on participating units and hospitals.

For the initial steps of the analysis, we examined the descriptive statistics for the hospital, unit and nurse characteristics, as well as the patients' perceptions of their discharge preparation and readiness for hospital discharge. Variables were summarized with appropriate descriptive (frequencies, percentages, means, SDs and ranges) and explorative measures based on measurement levels and data distributions.

Multilevel multivariate regression analysis was performed to examine the relationships between the variables of unit structure, nursing work environment, nurses' and patients' characteristics, and patient perceptions of discharge teaching with the variable of patient readiness for hospital discharge. Because the data were clustered (patient data=level 1; nurse survey data and unit data=level 2), the effects of the various characteristics were estimated using a random intercept model with hierarchical linear modelling (Rabe-Hesketh and Skrondal, 2012).

A bottom-up multilevel modelling approach was used, as described by Hox (2010). We began by building up the model's fixed part (intercept-only model). The random part was then incorporated via step-by-step addition of the various parameters. At each step, we inspected the estimates and standard errors to determine which parameters were significant (Raudenbush and Bryk, 2002). Multiple imputation by chained equations (van Buuren and Groothuis-Oudshoorn, 2011) was used to handle missing data for variables relating to the patient and nurse questionnaires. Regarding the patient questionnaire, 0%–13.4% of data were missing, depending on the variable; 0%–4.1% were missing from the nurse questionnaire. Prior to imputation, 1519 of 1755 patient questionnaires and 1759 of 1833 nurse questionnaires were complete regarding all variables of interest. Sensitivity analyses were done to compare the results of patients with more than two days of hospitalization (initial inclusion criteria) and those with less than two days of hospitalization. The

results did not show any significant differences in results and to avoid the problems of sample size the initial selection criteria was retained.

Stata 14.2 data analysis and statistical software was used for the main data analysis (Stata, 2015). Multiple imputation was done using the R software version 1.1 (R Development Core Team, 2017) and the Multivariate Imputation by Chained Equations (MICE) version 2.23 (van Buuren and Groothuis-Oudshoorn, 2011) package. Statistical significance was set at $p < 0.05$ for multivariate analysis.

3.4. Ethical considerations

Nurses and patients received their respective questionnaires introducing the study's purpose, explaining and guaranteeing the protection of their anonymity, and emphasizing that participation was voluntary (Bachnick et al., 2017). To protect the anonymity of all individual participants, we applied relevant protection mechanisms (e.g., coded dataset numbers, secure data storage). Match^{RN} was exempt from all cantonal ethical committees responsible for the participating hospitals (EKNZ UBE 15/59).

4. Results

4.1. Sample description

A total of 23 hospitals from Switzerland's three language regions participated in the study. More than two thirds of the included institutions ($n = 16$) were general hospitals; the average number of beds was 368 (range 67–920). We obtained data on 123 units from these hospitals. Further characteristics of the hospital sample are presented in Table 1.

Data were retrieved from 1833 registered nurses and 1755 patients. The mean response rate of nurses was 78%, (range: 17%–100%); the patients' mean response rate across all units was 72% (range: 17–100%). For registered nurses, the majority (87.8%) were female with a mean age at 35.3 years ($SD = 10.6$); slightly more than half (52.7%) were working part-time. The mean length of professional experience was 8 years ($SD = 8.4$). More than two-thirds of the nurses (71.7%) had a vocational training (Table 1). Concerning the socio-demographic characteristics of the patients, 56.5% were male; the mean age was 67.0 years ($SD = 15.8$). The mean length of stay was 8.2 days ($SD = 11.2$). At the time of the survey, the patients had been hospitalized for a mean of 3.4 days ($SD = 4.4$) (Table 2).

4.2. Patient perception of discharge teaching and readiness

Results of the descriptive analysis regarding patient perceptions of discharge preparation showed that the majority (62.2%) of patients had been given information about self-care during their hospitalization (Table 3).

4.3. Association of unit- and structure-related factors and patient readiness for hospital discharge

We identified unit characteristics associated with patient readiness for hospital discharge. Medical and larger units were significantly associated with lower levels of readiness (Table 4). No variables of the organizational context (i.e., leadership support, staffing and skill mix) were significant predictors of patient readiness for hospital discharge. While units with more experienced nurses were significantly associated with higher patient readiness, education level had no significant effect.

Table 1
Hospital, unit, nurse and organizational factor characteristics.

	n (%)	Mean (SD) Min-Max
Hospital characteristics (n = 23 hospitals)		
Number of beds		368.3 (281.9) 67–920
Type		
Teaching hospital	4 (17.4)	
General hospital	16 (69.6)	
District hospital	3 (13.0)	
Language region		
German-speaking part	15 (65.2)	
French-speaking part	4 (17.4)	
Italian-speaking part	4 (17.4)	
Unit characteristics (n = 123 units)		
Unit type		
Medical	62 (50.4)	
Surgical	54 (43.9)	
Mixed	7 (5.7)	
Nurse characteristics (n = 1833)		
Age		35.3 (10.6) 20 - 64
Gender, female	1610 (87.8)	
Percentage of employment		
100%	867 (47.3)	
76–99%	478 (26.1)	
51–75%	200 (10.9)	
10–50%	288 (15.7)	
Education level		
Bachelor degree	518 (28.3)	
Vocational training	1315 (71.7)	
Professional experience (years)		8.1 (8.4) 0 - 39
Organizational factors		
Leadership and support (PES-NWI-R) (1–4) ^a		3.1 (0.6) 1 - 4
Skill mix (% of RNs)		0.6 (0.2) 1 - 6
Staffing (Patient-to-nurse ratio)		7.0 (4.1) 0.4 - 31

Min. = Minimum; Max. = Maximum; SD = Standard Deviation. PES–NWI–R = Practice Environment Scale of the Revised Nursing Work Index. RNs = Registered Nurses.

^a 1 = strongly disagree; 2 = somewhat disagree; 3 = somewhat agree, 4 = strongly agree.

Better patient self-reported health status predicted an increase in patient readiness for hospital discharge. Both discharge teaching interventions (related to self-care teaching) and symptom management also predicted increased patient readiness for hospital discharge.

Table 2
Patient characteristics (n = 1755).

	n (%)	Mean (SD) Range
Patient characteristics		
Age		67.0 (15.8) 19 - 97
Gender, female	743 (44.5)	
Education level		
No graduation	39 (2.4)	
Primary education	355 (21.9)	
Professional school	679 (41.9)	
Secondary education	370 (22.8)	
Tertiary education	179 (11.0)	
Hospitalization		
Length of stay		8.2 (11.2)
Remaining days		3.4 (4.4)
Functional status EQ-5D-3 L (5–15) ^a		8.0 (2.1)

SD = Standard Deviation. EQ-5D-3 L = EuroQol-5 Dimension-3 Level scale.

^a 5 = no problem; 10 = some problems; 15 = extreme problems.

5. Discussion

The aim of this study was to explore the associations linking structure- and process-related factors with patient readiness for discharge. Patient readiness for hospital discharge ratings were higher in patients who had received discharge teaching interventions, in units whose nurses had high overall levels of professional experience, and where patients provided higher self-ratings of their health status. In larger medical units, patient readiness for hospital discharge was lower. The organizational context (i.e., leadership support, staffing and skill mix) was not associated with patient readiness for hospital discharge.

In contrast, Weiss et al. (2011) linked unit-level staffing to the quality of the nursing care process (i.e., discharge teaching) and to outcomes at discharge (i.e., readiness). One possible explanation for this difference in findings may be that we evaluated patient readiness with a single item, whereas Weiss et al. (2007) used the eight-item Readiness for Hospital Discharge Scale. Patients are known to overestimate their readiness for hospital discharge when it is assessed with a single item rather than with a more comprehensive scale. Weiss et al. (2014) furthermore demonstrated that a higher nurse assessment of discharge readiness was associated with lower 30-day readmission rates. Still, van Galen et al. (2017) demonstrated that, among patients who self-reported readiness for discharge (single item), 30-day readmission was less likely (odds ratio = 0.55; 95% confidence interval = 0.40 to 0.75). In future research, the evaluation of readiness for hospital discharge should be evaluated with a validated scale such as Weiss et al. scale (2014).

It was surprising that staffing and skill mix were not associated with patient readiness for discharge, nursing experience was. So, while time spent in nursing does not make every nurse an expert, it is an antecedent of expertise (Hutchinson et al., 2016), i.e., experience is necessary but not sufficient in itself for the development of expertise (Bobay, 2004). In our study we have evaluated the years of nursing experience, but several authors agree that this is associated with a better discharge preparation. Nosbusch et al. (2011) in a study of challenges confronting acute care staff nurses in discharge planning, found that years of nursing experience emerged as a predictive factor of 30-day readmission rates. The authors hypothesized that experienced nurses were more effective coordinators of discharge plans than novices or view discharge preparation as more of a priority compared to less experienced nurses. In another study, investigating the responses of patients, nurses, physicians and social workers, Bull et al. (1995) identified experience, including prior contact with a particular patient and the professionals' exposure to discharge planning and older adults, as significant influences on discharge planning communication. Consistent with this finding, Tilus (2002) correlated experience (in years) at the same hospital with the success of collaborative discharge planning (Tilus, 2002).

More experienced nurses have also been shown to provide higher-quality care in others domains of discharge preparation. For example, two studies of unit-level nurse staffing associated nurse experience inversely with inpatient medication errors (Blegen et al., 2001) and mortality (Van den Heede et al., 2009). This result is important for clinical practice because it suggests that, in order to provide high quality discharge preparation, nursing teams should include a certain proportion of experienced nurses. This should encourage managers not only to value nurses' experience but also to organize unit-level staffing in ways that promote an overall development of expertise, especially regarding discharge preparation (Simmons et al., 2003).

Unit size, i.e., bed count, had a small but significant inverse relationship with patient readiness of hospital discharge. It is already known that greater hospital size is significantly related to

Table 3
Patient perception of discharge teaching and readiness.

	n (%)
Self-care	
Yes	1014 (62.2)
No	367 (22.5)
Not necessary	248 (15.3)
Symptom management	
Yes	534 (33.3)
No	751 (46.8)
Not necessary	318 (19.9)
Discharge readiness	
Not at all	97 (6.2)
To little extend	132 (8.5)
To moderate extend	243 (15.6)
To large extend	489 (31.4)
To very large extend	349 (22.4)
I don't know	249 (15.9)

lower patient satisfaction (Mendelson et al., 2017; Wang et al., 2016). One reasonable hypothesis is that larger hospitals' higher complexity of coordination of care, often involving more complex patient needs, negatively impact the organization of patient care.

Previous studies also revealed a positive association between nurses' delivery of discharge teaching interventions and patient readiness for hospital discharge. Measuring the time allocated to discharge teaching interventions from nurses' reports, Weiss et al. (2011) found a positive association with patient readiness for discharge. In our study, we evaluated discharge teaching in a different way; i.e., by analysing patients' perceptions of how adequately their nurses had instructed them regarding self-care and symptom management. Notably, the results converge regardless of whether the nurses' or the patients' perspectives were analysed, confirming that discharge teaching is a valuable component of patient preparation for hospital discharge. This is an important result for nursing practice, discharge teaching is a core component of discharge planning to prepare patient to return at home. Further research is needed to improve our knowledge on how to teach patient.

These results suggest that nurses' discharge teaching during hospitalization could decrease the occurrence of 30-day hospital readmission (Weiss et al., 2014). Simply asking patients at the bedside whether they feel ready for discharge may be a first step towards improving the current results (Wallace et al., 2016; Weiss et al., 2015). Evaluation of discharge readiness is not currently a standard pre-discharge practice, either to increase patient security

and quality measurement or to improve discharge preparation. Pre-discharge implementation of these assessments may promote early identification of patients who lack adequate knowledge about post-discharge symptom management and other self-management skills (Coffey and McCarthy, 2013).

In brief, the implementation of discharge preparation interventions should consider not only the effectiveness of the interventions but also the hospital context in which they are delivered. This would provide a greater level of understanding about how each intervention influences the discharge process and which systems or processes are affected. Future research needs to further investigate the relationship between context and mechanisms of discharge preparation. Increasing our understanding in this respect would enhance the translation of discharge research into clinical practice, enabling us to determine whether we are addressing the real barriers to effective, timely and safe discharge, or simply their symptoms.

6. Strengths and limitations of the study

The nature of this study's cross-sectional design limits our ability to determine causal relationships between organizational context, nurses' interventions and patient readiness for discharge. Also, despite controlling for various patient and unit characteristics, it remains possible that we have omitted relevant covariates. Although we included a large national sample of Swiss acute-care hospitals, we investigated only registered nurses and patients from general medical, surgical and mixed medical-surgical units, which limits the generalizability of findings to these specific settings.

Despite selecting patients with a hospital stay of greater than 24 h, we cannot be certain that all patients were informed of their discharge dates and were therefore able to know whether they were sufficiently prepared for discharge. It is likely that some of the participants' negative responses were related to the fact that their discharge preparation was simply not complete at the time of the survey. Furthermore, our sampling favours patients who are capable of responding to a questionnaire therefore limiting the ability of the study generalising to more severe patients.

Several studies demonstrated that patients living alone at home have a lower readiness for hospital discharge (Coffey and McCarthy, 2012; Mabire et al., 2015a,b, Weiss et al., 2014, 2007). In future research, it will be necessary to have this information about the characteristics of the patients because it could moderate the relationship with the readiness for hospital discharge.

Table 4
Associations linking unit structure, organizational context, nurses' and patients' characteristics, and patient perception of discharge teaching with patient readiness for hospital discharge.

Variables	β (P-value)	95% confidence interval
Unit characteristics		
Unit size	−0.001 (0.001)	−0.002, −0.001
Medical unit	−0.447 (0.001)	−0.700, −0.195
Surgical unit	0.106 (0.714)	−0.462, 0.674
Organizational context		
Leadership and Support (PES-NWI-R)	−0.241 (0.142)	−0.562, 0.080
Staffing	−0.061 (0.114)	−0.138, 0.015
Skill mix	−0.108 (0.623)	−0.541, 0.324
Nurses' characteristics		
Professional experience	0.048 (0.048)	0.001, 0.095
Education level	0.288 (0.313)	−0.271, 0.847
Patient' characteristics		
EQ-5D-3L	−0.112 (0.001)	−0.169, −0.054
Discharge teaching		
Self-care teaching	1.335 (0.001)	1.075, 1.594
Symptom management teaching	0.794 (0.001)	0.525, 1.065

PES-NWI-R=Practice Environment Scale of the Revised Nursing Work Index, EQ-5D-3L=EuroQol-5 Dimension-3 Level scale.

7. Conclusions

Patients' readiness for hospital discharge was associated with their perceptions of discharge preparation interventions, with their nurses' professional experience and with the structure of their units. Elements of the organizational context, including leadership and support, staffing and skill mix, did not influence patient readiness for hospital discharge in this study. This result is inconsistent with findings from previous studies and invites further research on the relationship between nursing discharge preparation and hospital context. Our findings suggest, however, that contextual factors on both the individual and the hospital level—especially nurse experience—are related to patient readiness for hospital discharge and must be considered when making human resource decisions. For clinical nursing practice, these results reinforce the importance of discharge teaching for the preparation of patient discharge. This study is promising to continue research on the relationship between the health care environment, the models and mechanisms of discharge preparation, and the effects on patient readiness for hospital discharge and readmission.

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References

- Aiken, L.H., Cimiotti, J.P., Sloane, D.M., Smith, H.L., Flynn, L., Neff, D.F., 2011. Effects of nurse staffing and nurse education on patient deaths in hospitals with different nurse work environments. *Med. Care* 49 (12), 1047–1053.
- Aiken, L.H., Clarke, S.P., Cheung, R.B., Sloane, D.M., Silber, J.H., 2003. Educational levels of hospital nurses and surgical patient mortality. *JAMA* 290 (12), 1617–1623.
- Aiken, L.H., Clarke, S.P., Sloane, D.M., Sochalski, J., Silber, J.H., 2002. Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. *JAMA* 288 (16), 1987–1993.
- Aiken, L.H., Sermeus, W., Van den Heede, K., Sloane, D.M., Busse, R., McKee, M., Bruyneel, L., Rafferty, A.M., Griffiths, P., Moreno-Casbas, M.T., Tishelman, C., Scott, A., Brzostek, T., Kinnunen, J., Schwendimann, R., Heinen, M., Zikos, D., Sjetne, I.S., Smith, H.L., Kutney-Lee, A., 2012. Patient safety, satisfaction, and quality of hospital care: cross sectional surveys of nurses and patients in 12 countries in Europe and the United States. *BMJ* 344, e1717.
- Aiken, L.H., Sloane, D.M., Bruyneel, L., Van den Heede, K., Griffiths, P., Busse, R., Diomidou, M., Kinnunen, J., Kózka, M., Lesaffre, E., McHugh, M.D., Moreno-Casbas, M.T., Rafferty, A.M., Schwendimann, R., Scott, P.A., Tishelman, C., van Achterberg, T., Sermeus, W., 2014. Nurse staffing and education and hospital mortality in nine European countries: a retrospective observational study. *Lancet* 383 (9931), 1824–1830.
- Anthony, M.K., Hudson-Barr, D.C., 1998. Successful patient discharge. A comprehensive model of facilitators and barriers. *J. Nurs. Adm.* 28 (3), 48–55.
- Ausserhofer, D., Zander, B., Busse, R., Schubert, M., De Geest, S., Rafferty, A.M., Ball, J., Scott, A., Kinnunen, J., Heinen, M., Strömberg Sjetne, I., Moreno-Casbas, T., Kózka, M., Lindqvist, R., Diomidou, M., Bruyneel, L., Sermeus, W., Aiken, L.H., Schwendimann, R., 2014. Prevalence, patterns and predictors of nursing care left undone in European hospitals: results from the multicountry cross-sectional RN4CAST study. *BMJ Qual. Saf.* 23 (2), 126–135.
- Bachnick, S., Ausserhofer, D., Januel, J.M., Schubert, M., Schwendimann, R., De Geest, S., Simon, M., 2017. Matching Registered Nurse services with changing care demands (MatchRN): study protocol of a natural experiment multi-centre study. *J. Adv. Nurs.* 73 (7), 1735–1746.
- Blegen, M.A., Vaughn, T.E., Goode, C.J., 2001. Nurse experience and education: effect on quality of care. *J. Nurs. Adm.* 31 (1), 33–39.
- Bobay, K.L., 2004. Does experience really matter? *Nurs. Sci. Q.* 17 (4), 312–316.
- Bobay, K.L., Jerofke, T.A., Weiss, M.E., Yakusheva, O., 2010. Age-related differences in perception of quality of discharge teaching and readiness for hospital discharge. *Geriatr. Nurs.* 31 (3), 178–187.
- Bowles, K.H., Foust, J.B., Naylor, M.D., 2003. Hospital discharge referral decision making: a multidisciplinary perspective. *Appl. Nurs. Res.* 16 (3), 134–143.
- Bull, M.J., Maruyama, G., Luo, D., 1995. Testing a model for posthospital transition of family caregivers for elderly persons. *Nurs. Res.* 44 (3), 132–138.
- Carthon, J.M.B., Lasater, K.B., Sloane, D.M., Kutney-Lee, A., 2015. The quality of hospital work environments and missed nursing care is linked to heart failure readmissions: a cross-sectional study of US hospitals. *BMJ Qual. Saf.* 24 (4), 255–263.
- Coffey, A., McCarthy, G.M., 2012. Older People's perception of their readiness for discharge and postdischarge use of community support and services. *Int. J. Older People Nurs.*
- Coffey, A., McCarthy, G.M., 2013. Older people's perception of their readiness for discharge and postdischarge use of community support and services. *Int. J. Older People Nurs.* 8 (2), 104–115.
- Coleman, E.A., Parry, C., Chalmers, S., Min, S.J., 2006. The care transitions intervention: results of a randomized controlled trial. *Arch. Int. Med.* 166 (17), 1822–1828.
- Donabedian, A., 2005. Evaluating the quality of medical care. *Milbank Q.* 83 (4), 691.
- Driscoll, A., 2000. Managing post-discharge care at home: an analysis of patients' and their carers' perceptions of information received during their stay in hospital. *J. Adv. Nurs.* 31 (5), 1165–1173.
- Henderson, A., Zernike, W., 2001. A study of the impact of discharge information for surgical patients. *J. Adv. Nurs.* 35 (3), 435–441.
- Hox, J.J., 2010. *Multilevel Analysis: Techniques and Applications*. Routledge, New York.
- Hutchinson, M., Higson, M., Cleary, M., Jackson, D., 2016. Nursing expertise: a course of ambiguity and evolution in a concept. *Nurs. Inq.* 23 (4), 290–304.
- Jha, A.K., Orav, E.J., Epstein, A.M., 2009. Public reporting of discharge planning and rates of readmissions. *N. Engl. J. Med.* 361 (27), 2637–2645.
- Jones, P.S., Lee, J.W., Phillips, L.R., Zhang, X.E., Jaceldo, K.B., 2001. An adaptation of Brislin's translation model for cross-cultural research. *Nurs. Res.* 50 (5), 300–304.
- Kalisch, B.J., Landstrom, G.L., Williams, R.A., 2009. Missed nursing care: errors of omission. *Nurs. Outlook* 57 (1), 3–9.
- Krichbaum, K., Diemert, C., Jacox, L., Jones, A., Koenig, P., Mueller, C., Disch, J., 2007. Complexity compression: nurses under fire. *Nurs. Forum* 42 (2), 86–94.
- Lake, E.T., 2002. Development of the practice environment scale of the Nursing Work Index. *Res. Nurs. Health* 25 (3), 176–188.
- Lasater, K.B., McHugh, M.D., 2016. Nurse staffing and the work environment linked to readmissions among older adults following elective total hip and knee replacement. *Int. J. Qual. Health Care* 28 (2), 253–258.
- Lucero, R.J., Lake, E.T., Aiken, L.H., 2010. Nursing care quality and adverse events in US hospitals. *J. Clin. Nurs.* 19 (15–16), 2185–2195.
- Ma, C., McHugh, M.D., Aiken, L.H., 2015. Organization of hospital nursing and 30-day readmissions in medicare patients undergoing surgery. *Med. Care* 53 (1), 65–70.
- Mabire, C., Bula, C., Morin, D., Goulet, C., 2015a. Nursing discharge planning for older medical inpatients in Switzerland: a cross-sectional study. *Geriatr. Nurs.* 36 (6), 451–457.
- Mabire, C., Coffey, A., Weiss, M., 2015b. Readiness for hospital discharge for older people: psychometric testing and short form development with a three country sample. *J. Adv. Nurs.* 71 (11), 2686–2696.
- Mabire, C., Dwyer, A., Garnier, A., Pellet, J., 2018. Meta-analysis of the effectiveness of nursing discharge planning interventions for older inpatients discharged home. *J. Adv. Nurs.* 74 (4), 788–799.
- McHugh, M.D., Berez, J., Small, D.S., 2013. Hospitals with higher nurse staffing had lower odds of readmissions penalties than hospitals with lower staffing. *Health Aff. (Millwood)* 32 (10), 1740–1747.
- McHugh, M.D., Ma, C., 2013. Hospital nursing and 30-Day readmissions among medicare patients with heart failure, acute myocardial infarction, and pneumonia. *Med. Care* 51 (1), 52–59.
- Mendelson, A., Kondo, K., Damberg, C., Low, A., Motuapuaka, M., Freeman, M., O'Neil, M., Relevo, R., Kansagara, D., 2017. The effects of pay-for-Performance programs on health, health care use, and processes of care: a systematic review. *Ann. Intern. Med.* 166 (5), 341–353.
- Mistiaen, P., Francke, A.L., Poot, E., 2007. Interventions aimed at reducing problems in adult patients discharged from hospital to home: a systematic meta-review. *BMC Health Serv. Res.* 7, 47.
- Naylor, M.D., Aiken, L.H., Kurtzman, E.T., Olds, D.M., Hirschman, K.B., 2011. The care span: the importance of transitional care in achieving health reform. *Health Aff. (Millwood)* 30 (4), 746–754.
- Needleman, J., Buerhaus, P., Pankratz, V.S., Leibson, C.L., Stevens, S.R., Harris, M., 2011. Nurse staffing and inpatient hospital mortality. *N. Engl. J. Med.* 364 (11), 1037–1045.
- Nosbusch, J.M., Weiss, M.E., Bobay, K.L., 2011. An integrated review of the literature on challenges confronting the acute care staff nurse in discharge planning. *J. Clin. Nurs.* 20 (5/6), 754–774.
- R Development Core Team, 2017. *R: a language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria.
- Rabe-Hesketh, S., Skrondal, A., 2012. *Multilevel and Longitudinal Modeling Using Stata*. Stata Press, College Station, TX.
- Schubert, M., Ausserhofer, D., Desmedt, M., Schwendimann, R., Lesaffre, E., Li, B., De Geest, S., 2013. Levels and correlates of implicit rationing of nursing care in Swiss acute care hospitals—a cross sectional study. *Int. J. Nurs. Stud.* 50 (2), 230–239.
- Sermeus, W., Aiken, L.H., Van den Heede, K., Rafferty, A.M., Griffiths, P., Moreno-Casbas, M.T., Busse, R., Lindqvist, R., Scott, A.P., Bruyneel, L., Brzostek, T., Kinnunen, J., Schubert, M., Schoonhoven, L., Zikos, D., consortium, R.C., 2011. Nurse forecasting in Europe (RN4CAST): rationale, design and methodology. *BMC Nurs.* 10, 6.

- Simmons, B., Lanuza, D., Fonteyn, M., Hicks, F., Holm, K., 2003. Clinical reasoning in experienced nurses. *West. J. Nurs. Res.* 25 (6), 701–719 discussion 720–704.
- Stata, 2015. *Stata Statistical Software: Release 14*. StataCorporation, College Station, TX.
- Tilus, S.L., 2002. The influence of nursing education on collaborative discharge planning. *J. Nurses Staff Dev.* 18 (5), 274–281.
- van Buuren, S., Groothuis-Oudshoorn, K., 2011. mice: Multivariate imputation by chained equations in R. *J. Stat. Softw.* 45 (3), 1–67.
- Van den Heede, K., Sermeus, W., Diya, L., Clarke, S.P., Lesaffre, E., Vleugels, A., Aiken, L.H., 2009. Nurse staffing and patient outcomes in Belgian acute hospitals: cross-sectional analysis of administrative data. *Int. J. Nurs. Stud.* 46 (7), 928–939.
- van Galen, L.S., Brabrand, M., Cooksley, T., van de Ven, P.M., Merten, H., So, R.K., van Hooff, L., Haak, H.R., Kidney, R.M., Nickel, C.H., Soong, J.T., Weichert, I., Kramer, M.H., Subbe, C.P., Nanayakkara, P.W., 2017. Patients' and providers' perceptions of the preventability of hospital readmission: a prospective, observational study in four European countries. *BMJ Qual. Saf.* 26 (12), 958–969.
- Wallace, A.S., Perkhounkova, Y., Bohr, N.L., Chung, S.J., 2016. Readiness for hospital discharge, health literacy, and social living status. *Clin. Nurs. Res.* 25 (5), 494–511.
- Wang, D.E., Tsugawa, Y., Figueroa, J.F., Jha, A.K., 2016. Association between the centers for medicare and medicaid services hospital star rating and patient outcomes. *JAMA Intern. Med.* 176 (6), 848–850.
- Weiss, M.E., Bobay, K.L., Bahr, S.J., Costa, L., Hughes, R.G., Holland, D.E., 2015. A model for hospital discharge preparation: from case management to care transition. *J. Nurs. Adm.* 45 (12), 606–614.
- Weiss, M.E., Costa, L.L., Yakusheva, O., Bobay, K.L., 2014. Validation of patient and nurse short forms of the readiness for hospital discharge scale and their relationship to return to the hospital. *Health Serv. Res.* 49 (1), 304–317.
- Weiss, M.E., Piacentine, L.B., Lokken, L., Ancona, J., Archer, J., Gresser, S., Holmes, S.B., Toman, S., Toy, A., Vega-Stromberg, T., 2007. Perceived readiness for hospital discharge in adult medical-surgical patients. *Clin. Nurse Spec.* 21 (1), 31–42.
- Weiss, M.E., Yakusheva, O., Bobay, K.L., 2011. Quality and cost analysis of nurse staffing, discharge preparation, and postdischarge utilization. *Health Serv. Res.* 46 (5), 1473–1494.