Patient-centered care in Swiss acute care hospitals: addressing challenges in patient experience measurement and provider profiling

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List of Abbreviations

AHRQ	Agency for Healthcare Research and Quality
ANQ	Nationaler Verein für Qualitätsentwicklung in Spitälern und Kliniken (Swiss National Association for Quality Development in Hospitals and Clinics)
APDRGs	All Patient Diagnosis-Related Groups
β	Beta Coefficient
BERNCA	Basel Extent of Rationing in Nursing Care
CEO	Chief Executive Officer
CHOP	Schweizerische Operationsklassifikation (Swiss operation procedure classification)
CI	Confidence Interval
DCPs	Department case-based payments
DRGs	Diagnosis-Related Groups
EQ-5D-3L	EuroQol-5 dimension-3 levels scale
GS-PEQ	General Short Patient Experiences Questionnaire
HCAHPS	Hospital Consumer Assessment of Healthcare Providers and Systems survey
HMD	Health and Medicine Division
ICD–10	International Classification of Diseases, 10th revision
ICC	Intra-class correlation
IOM	Institute of Medicine
LOS	Length of stay
Match^{RN}	Matching Registered Nurse services with changing care demands
MICE	Multiple imputation by chained equations
MSN	Master of Science in Nursing
NHS	National Health Service
OECD	Organisation for Economic Co-operation and Development
PCC	Patient-centered care
PES-NWI	Practice Environment Scale–Nursing Work Index
PLT	Prozess-Leistungs-Tarifierung
PREM	Patient reported experience measures
PSIs	Patient safety indicators
RN	Registered Nurse
RN4CAST	Nurse Forecasting: Human Resources Planning in Nursing
SAMS	Swiss Academy of Medical Sciences
SAQ	Safety Attitude Questionnaire
SCQ	Self-Administered Comorbidity Questionnaire
SD	Standard deviation
SwissDRGs	Swiss Diagnosis-Related Groups
WHO	World Health Organization

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Summary

Hospitals are under continuous pressure to enable and provide care that is safe, effective, timely, efficient, equitable and patient-centered. To assess the overall quality of the care they deliver, patient experience measures are commonly used across health care settings, countries and patient populations. While these measures are widely employed, though, their impact on quality improvement remains questionable. The analyses of the dissertation indicates that, in addition to lacking a clear conceptualization of the measured construct (e.g., patient-centered care (PCC) or patient satisfaction), the psychometric properties of the most widely-used and influential quality of care instruments are inadequate to ensure reliable assessment of the target criteria. For example, patient experience questionnaires commonly suffer from ceiling effects, resulting in their failure to differentiate between providers scoring above a certain level. Still, the resulting data are incorporated in the steering mechanisms intended to improve quality of care, and weigh heavily on hospital ranking and profiling systems. Based largely on inadequate rating models, then, health care administrators identify hospitals as positive and negative deviants, i.e., high or low performers. Following the logical principle that quality-based selection will lead to long-term quality improvement, higher-ranked hospitals are selected to provide more services and receive more funding. However, at the questionnaire development level, the basic methodological weaknesses noted above preclude accurate quality measurement. If the instruments used in provider profiling lack the capacity to distinguish meaningfully between providers, it follows that the fairness of decisions based on those instruments‘ data is dubious at best.

Besides quality improvement through selection, improvement through change is discussed. Effective measurement of organizational processes and structures illuminated which areas worked well and which could benefit from improvement. Still, studies found that individual staff factors such as communication and relationship building skills clearly improve PCC, the effects of structures and processes at the unit and hospital levels were less clear.

One vital task in quality assessment and improvement is to determine how instruments can be improved to fully assess their underlying constructs. Moreover, with consideration for individual patient preferences, every instrument requires both the sensitivity and the reliability to differentiate meaningfully between levels of quality of care.

This dissertation aims to assess PCC and its association with institution-level structures and processes in Swiss acute care hospitals. Beyond that, its target is to improve PCC measurement by including patient preference ratings. By providing a much-needed frame of reference regarding patient care ratings, thereby increasing between-provider variances to usable levels, this addition is intended to improve the care quality measurement process. The included studies are embedded in the Matching Registered Nurse Services with Changing Care Demands (Match^{RN}) study. The dissertation is organized in seven chapters.

Chapter 1 gives an overall introduction to PCC. Focusing on the definition and conceptualization of PCC, it provides a conceptual model for PCC provision in the hospital setting. With the description of challenges in PCC provision, two improvement pathways – selection and change – are discussed. An overview of the current state of research on PCC in acute care hospitals, its measurement and its associations not only with patient-related, clinical and economic outcomes, but also with health care policy, is presented. The chapter ends by summarizing the gaps in the literature, alongside this dissertation‘s contribution to bridging those gaps.

Following this introduction, Chapter 2 describes the dissertation‘s aims. The findings of the four component studies are reported (Chapter 3 to Chapter 6).

Chapter 3 explains the Match^{RN} study protocol. It provides a general introduction to

the Match^{RN} study's background, rationale and aims, design and methodology, including measurement techniques.

Chapter 4 reports on the first of the dissertation's studies, which describes the level of PCC in Swiss acute care hospitals and its associations with the nursing work environment and rationing of nursing care. In its sample of 2073 patients and 1810 registered nurses in 23 Swiss acute care hospitals with 123 units, patients reported generally high levels of PCC. Based on four items assessing PCC, the large majority reported that they easily understood the nurses (90%) and felt the treatment and care they received were adapted to their situations (91%), four-fifths (82%) received sufficient information, whereas one-third (30%) felt insufficiently involved in treatment and care decisions. Further, the analysis identified PCC-associated structural and process factors. Generalized Linear Mixed Models for analysis, including individual-level patient and nurse data aggregated to the unit level, identified positive associations between PCC and the nurse work environment: higher staffing and resource adequacy was associated with higher levels of all four items, with sufficient information (β 0.638 [95%-CI: 0.30 – 0.98]) and adapted treatment and care (β 0.456 [95%-CI: 0.04 – 0.87]) yielding the highest correlations. Higher leadership ratings were associated both with sufficient information (β 0.403 [95%-CI: 0.03 – 0.77]) and with adapted treatment and care (β 0.462 [95%-CI: 0.04 – 0.88]). Negative associations were found between implicit rationing of nursing care and three PCC dimensions: adapted treatment and care (β -0.912 [95%-CI: -1.50 – -0.33]), sufficient information (β -0.764 [95%-CI: -1.27 – -0.26]) and easy understanding (β -0.781 [95%-CI: -1.41 – -0.15). No associations were found between PCC and adjusted staffing. To improve PCC, the nurses' work environment and the level of implicit rationing of nursing care should be taken into consideration.

Chapter 5 discusses the need for to consider intra-class correlations (ICCs), i.e., ICC1 (levels of random variation) and ICC2 (measurement error due to "noise") as prerequisites for provider profiling. For the measurement and comparison of performance (e.g., PCC levels) between providers (e.g., hospitals), "noise" (also referred to as statistical uncertainty, chance or random variation) has to be filtered out to assess "true" variation. To apply provider profiling, patient survey data (n=1716–1863) assessing patient hospital stay experiences from the Match^{RN} 2015/2016 data collection were used. To gauge variations between providers and the reliability of current profiling methods, this study used mixed effect models to calculate ICC1 and ICC2 at the unit (n=123) and hospital (n=23) levels. Via analytical approaches including plots, permutation tests, and the application of a 95% confidence interval to the ICC1 value, between-provider variance was examined for all nine patient experience items. While ICC1 values for both unit (0.013 to 0.059 [mean: 0.03]) and hospital levels (0.009 to 0.035 [mean 0.023]) indicated little to no between-provider variability, the ICC2 indicated moderate to good reliability on the unit (0.62 to 0.885 [mean 0.691]) and hospital (0.176 to 0.454 [mean 0.345]) levels. In addition to the low ICC1 values providing a compelling argument against the use of patient experience data as a quality indicator, this analysis emphasizes the benefits of the applied analytical approaches for provider profiling.

As described in Chapter 5's study, provider profiling measurements need to be improved regarding their between-profiler variances. Chapter 6 presents the results of an explorative study examining patient preferences as predictor variables of between-provider variance in hospital profiling, while also examining the extent to which hospitals are able to meet patient preferences and needs. This study used data from the second Match^{RN} data collection (2017/2018), which included a sample of 2159 patients in 142 units in 25 Swiss hospitals. The findings indicate an imbalance between patients' perceptions of PCC levels and their preferences in all 13 assessed care aspects, i.e., for every tested aspect of care, overall patients' ratings of their perceived care levels where considerable lower than their overall preference levels. The greatest differences concerned whether patients received

detailed information about the side effects of prescribed medications: while 87% of the patients reported this as very important, slightly more than one-third (31.4%) reported always receiving sufficient information. With results such as these, growth targets can be defined and improvement initiatives designed accordingly. Likewise, resources can be optimized to develop and implement improvement strategies where they are most needed. Further, the inclusion of patient preferences yielded readily discernible inter-provider differences regarding PCC performance. Between-provider variances increased in all 13 models incorporating patient preferences as predictor variables: of those 13, the 9 adjusted to test preference variables yielded the highest between-provider variances. This study concludes that patient preferences are important predictor variables, and should be included in assessments both of patient hospital stay experiences and of provider profiling analyses.

Finally, Chapter 7 both synthesizes the major findings of the dissertation‘s individual studies and discusses the methodological strengths and limitations of the dissertation as a whole. Moreover, implications for further research, clinical practice and policy are recommended.

Overall, this dissertation highlights six major findings. First, high levels of PCC are apparent in the studied sample. Still, the data highlighted potential for improvement regarding patient involvement in decisions regarding their treatment and care could be identified. As a key element of PCC, patient involvement builds the basis for equal partnerships between clinicians and patients. Second, structure- and process-related factors need to be considered in PCC improvement. While this applies especially strongly to PCC‘s correlations first with increased staffing and resource adequacy‘s and second with reduced levels of implicit rationing of nursing care, it was also significant regarding leadership‘s associations with patient perceptions of PCC delivery. Surprisingly, though, adjusted staffing was not associated in any of the four tested PCC dimensions. Third, provider profiling based on patient experience items such as PCC perceptions currently fail due to lack of between-provider variance. Fourth, to fully assess and examine between-provider variance, both calculated (i.e. ICC1 values) and visualized (i.e. empirical Bayes) analytical approaches should be used. Fifth, to improve measurement of patients‘ PCC perceptions, preference ratings have to be included in provider profiling analyses, as they increase between-provider variance to usable levels. Sixth, to assess the extent to which hospitals meet the need for patient-specific care, patient preferences need to be assessed and included in analyses.

This dissertation contributes to the existing literature by providing primary evidence regarding the influence of patient preferences on the measurement of quality of care. Future research should explore further opportunities to improve PCC measurement.

Chapter 1

Introduction

The US National Academy of Medicine (NAM [formerly the Institute of Medicine (IOM)]) defines six key elements of quality of care: safety, effectiveness, timeliness, efficiency, equitable care and patient-centeredness [1]. Over the last decade, because patient-centered care (PCC) may improve patient-reported, clinical and economic outcomes, it has attracted increasing interest from stakeholders [2-4]. However, due to different conceptualizations, measurement of PCC is neither clear nor consistent. Additionally, related constructs such as patient satisfaction are often used interchangeably with PCC, although patient satisfaction is an outcome of PCC.

PCC falls within the category of patient experiences with care–an increasingly important resource for quality improvement in health care [5-7]. Firstly, following assessment, improvement potential can be identified via patient experience ratings and targeted interventions developed and implemented. Secondly, patients‘ PCC ratings serve as a steering mechanism to improve quality of health care in all health care settings, particularly in pay-for-performance programs [8, 9]. For example in the U.S., comparison of Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) data guides the distribution of funds. Of each hospital‘s total performance score, roughly a quarter is based on patient HCAHPS ratings [10].

Considering the weight this places on PCC ratings in funding decisions, it is vital that those ratings be fair and reliable. Therefore, this dissertation focuses on gaps in the conceptualization, operationalization, measurement and analysis of PCC.

1.1 Patient-centered care

1.1.1 Definition

The NAM‘s most widely used and accepted definition of PCC is “care that is (1) respectful of and responsive to individual patients‘ preferences, needs, and values and (2) ensuring that patients‘ values guide all decisions” [1 p.3]. This definition is focused on two main aspects of PCC: (1) every patient has personal preferences; and (2) these are the basis of the entire caring process. PCC is also known as negotiated and individualized care [12]. Other variations include “person-centered care”, “people-centered care”, “person-focused care”, “patient-focused care”, “client-centered care” or “whole-person-centered care”, and may also refer to the family, e.g., “patient and family centered care”, are used in the literature [13]. Whatever their names, though, all concepts are essentially based on NAMs definition. Unfortunately, as a construct PCC is inconsistently operationalized, with varying dimensions [14].

1.1.2 Conceptualization

Since PCC was first defined, numerous aspects and frameworks have been discussed, resulting in uncounted models. One definition that predates NAM was Gerteis et al.s reference to care “through the patients eyes” [15]. Gerteis describes seven dimensions of patient centeredness: (1) *respect for patients‘ values, preferences, and expressed needs*; (2) *coordination and integration of care*; (3) *information, communication and education*; (4) *physical comfort*; (5) *emotional support*; (6) *involvement of family and friends*; and (7) *continuity and transition* [15].

Other research groups adapted and added to Gerteis‘ definition to fit their foci. The non-profit Picker Institute added an eighth dimension: *access to care* [16]. The Health Foundation focused only on four dimensions: (a) *focus on patients preferences*; (b) *patient communication*; (c) *patient involvement*; and (d) *patient empowerment* [13]. Similarly, Morgan and Yoder (2012) developed a theoretical model of PCC consisting of four key attributes (*holistic care, individualized care, respectful care and empowering care)* [17], while Scholl‘s (2014) systematic review identified 15 dimensions of PCC:

divided into three classes: enablers (*coordination, continuity and integration of care, clinician-patient communication, teamwork, access to care)*, principles (*patient as a unique person, biopsychosocial perspective, characteristics of the clinicians, clinician-patient relationship)* and activities *(*physical and emotional support, information, patient as well as family involvement and empowerment) [18]. Greene et al. (2012) stratified their dimensions onto three levels: clinical, structural, and interpersonal [19]. Noting the complexity both of the PCC construct and of its provision, Greene took a bird‘s-eye view of the entire system and all its actors. This viewpoint was supported by Kitson et al. (2013), whose review summarized the dimensions relating to policy, medicine and nursing literature that underpin the interdisciplinary nature of the PCC construct [20].

From the diverse conceptualizations named here emerged equally diverse sets of PCC dimensions and details. Table 1.1 outlines the dimensions most consistently used in common models and key references in the PCC literature. Whatever changes have been made, though, every model still includes versions of the NAM's original two dimensions (“the patient as a unique person and “patient are involved in decisions/share decision making (SDM)”). Further, seven of the nine sources include an “information” dimension, and six each include dimensions of “communication”, “empowerment” or both. Thus, the five most used dimensions are: (1) *patient as a unique person*; (2) *patient involvement in care/decision making*; (3) *patient information*; (4) *clinical-patient communication*; and (5) *patient empowerment* [21].

The first of these refines the NAM‘s definition that “individual patients‘ preferences, needs, and values” guide the care process, making it essential to PCC. The patient has to be treated as unique, with individual feelings, experiences and preferences [15, 21]. The second dimension focuses on patients‘ involvement in decisions relevant to their treatment and care [21]. To be involved in such processes, patients need information about diagnoses, treatment options, or alternate care processes. In line with the first dimension, the provided information needs to be tailored to patient needs in terms of comprehensibility and detail [15, 21]. Therefore, the clinician-patient communication dimension, which acknowledges the value of verbal and non-verbal communication skills, plays an important role [21]. Together with these four dimensions, patient empowerment (dimension 5) encourages patients to self-manage their conditions and increase their self-care ability [15, 21].

For this dissertation, therefore these five dimensions were chose to operationalize PCC, as they were most consistently described within the reviewed sources. This decision is supported by Scholl et al.‘s systematic review [18], which identified 15 PCC dimensions and used a Delphi method to rank them by relevance and clarity.

Table 1.1: Sources describing the key dimensions of PCC

	De Silva, 2014	IAPO, 2007	Mead & Bower, 2000	Picker Institute	Mirzaei et al., 2013	Greene et al., 2012	Stewart et al., 2000	Scholl et al., 2014	Gerteis et al., 1991; NAM, 2001	Frequency of dimensions
Unique person	+	+	+	+	+	+	+	+	+	9
Relationship	-	-	+	+	-	+	+	+	-	5
Communication	+	-	-	+	+	+	-	+	+	6
Information	-	+	-	+	+	+	+	+	+	7
Involvement/share decision making	+	+	+	+	+	+	+	+	+	9
Empowerment	+	+	-	-	+	+	-	+	+	6
Coordination/continuity	-	-	-	+	+	+	-	+	+	5
Physical comfort	-	-	+	+	-	-	-	+	+	4
Emotional comfort	-	-	+	+	-	-	-	+	+	4
Take into account family/friends	-	-	-	+	-	+	-	+	+	4
Access to care	-	+	-	+	-	+	-	+	-	4

1.2 Providing PCC in hospital settings: A conceptual model

In a hospital setting, PCC can be adapted, delivered and supported on various levels. Guided by The Joint Commission‘s clinical microsystems approach [22] and Donabedian‘s structure-process-outcome model [23], for this dissertation an adopted and developed conceptual model is used. Figure 1.1 provides an general overview of PCC provision in in-patient health care settings.

Depending on one‘s focus, the hospital setting involves micro-, meso- and macro-level factors. The micro level is where the individuals are located, including the patients and hospital staff; the meso level focuses on structures and processes, i.e., unit and hospital factors. The macro level involves health care policies and the healthcare system. These three levels impact the provision of PCC independently, but are interrelated. Further, for every level, various factors influence PCC [24, 25]. On the micro level, factors stem both from hospital staff, e.g., years of training and experience, and from individual patients. For patients, age, gender, education and other demographic characteristics can have varying levels of significance; in the PCC context, however, their preferences regarding their care delivery are both extremely important and widely unexplored [26-28]. For hospital staff, one determinant of how well they provide PCC is their interpersonal skills, especially regarding communication and relationship building [29, 30].

At the meso level, PCC influencing unit and hospital factors include processes and structures including the work environment, leadership strategies, teamwork levels, ownership status or the number of beds [31, 32]. This level is also influenced by both individual- and macro-level factors, e.g., health policies affect payment schemes and funding systems. The macro level influences PCC only indirectly, through its influence on the meso level. The final part of the model shows the different outcomes PCC can have depending of the targeted level. Detailed information on PCC‘s outcomes is available in section 1.5.2 below.

1.3 Challenges to the provision of PCC

Figure 1.1 shows the multi-dimensional nature of PCC, the provision of which is broadly recognized as challenging [16, 33]. Challenges arise from two main sources: (1) the complexity of PCC provision; and (2) the heterogeneity of most patient populations.

Complexity
Because of the broad range of PCC‘s dimensions, providing it adequately usually requires complex strategies targeting multiple levels. While the patient (micro level) is always at the center, as indicated by Greene (2012), meso- and macro-level factors both also demand consideration. At the micro level, interpersonal factors often require improvement [19]. For instance to treat each patient as unique, with individual preferences and needs, the clinician needs to use advanced communication and patient-clinician relationship building skills. These allow assessment of the preferences that will guide all PCC-related decisions during the patient‘s stay. To foster trust and cooperation between clinician and patient, patient-tailored communication techniques including information sharing are further essential aspects of PCC, and the building blocks for patients‘ involvement in their care [33]. Micro-level factors such as these are basic elements of PCC.

At the meso level, PCC is influenced by organizational factors such as health care processes and structures that apply to wards, departments, or the entire hospital. The modification of processes such as patient involvement, coordination and continuity of care can improve health care outcomes significantly. For example, clinical pathways to improve care coordination for patients with comorbidities, bedside shift reporting in cooperation with patients, PCC-focused information technology measures have been

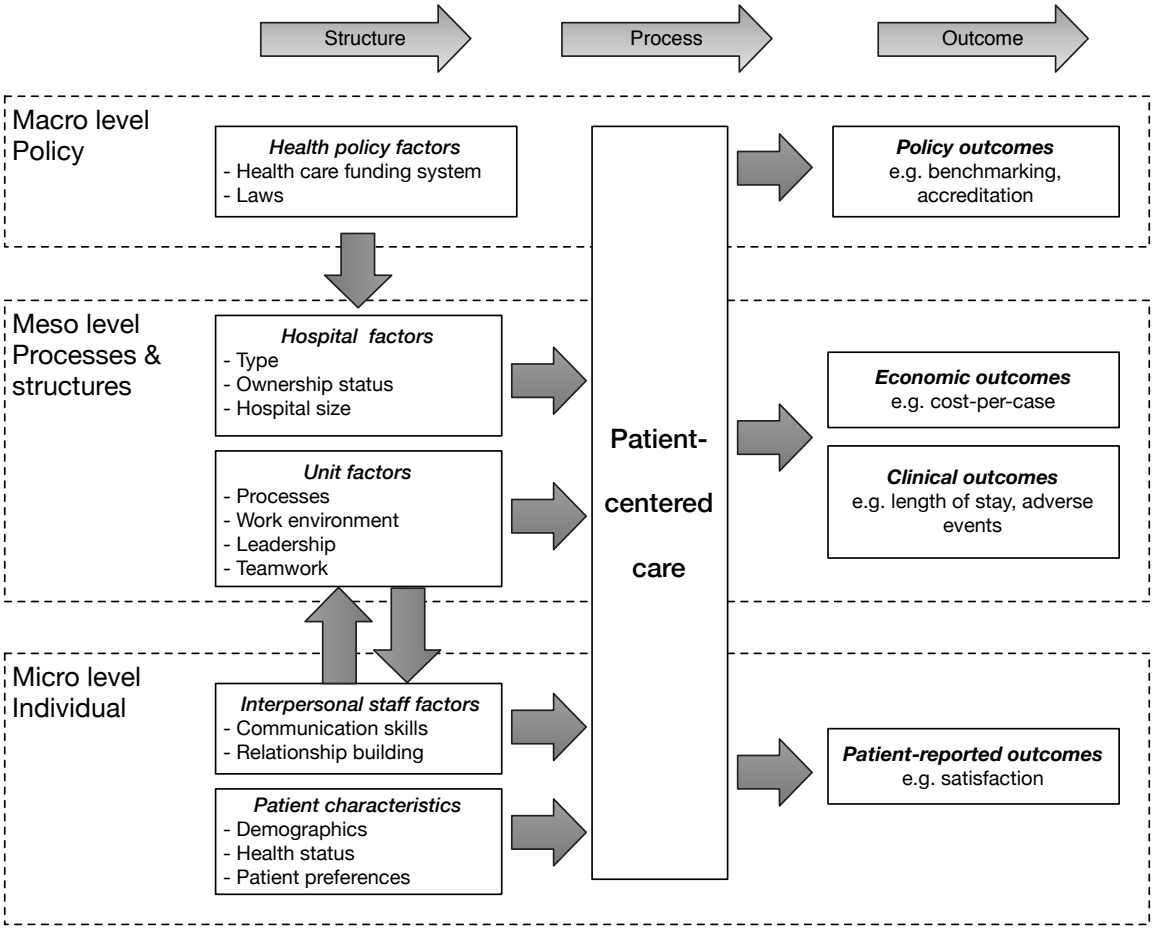

Figure 1.1: Different levels influencing PCC in hospital setting

successfully implemented to improve patients‘ clinical outcomes [34, 35].

Structural factors such as the nurse work environment also influence PCC outcomes. A recent qualitative study emphasized the value of strong leadership for improving PCC [31]. Optimal PCC provision requires a supportive work environment and leadership support at the level of the CEO and board of directors [36]. However, regarding the relationship between PCC and patients‘ perceptions of the care they receive, research results are inconsistent. Following an intervention aimed at improving teamwork, Kohler et al. found no significant differences in patient perceptions of PCC [37].

Various studies have examined the impact of work environment on patient satisfaction but not PCC. E.g., a US-based multi-center study confirmed that reduced patient to nurse ratios were associated with increased patient satisfaction following improvements to information exchange based on patient-tailored communication [38]. Further, patients are more likely to recommend hospitals with lower patient/nurse ratios [38-40]. Cross-sectional studies examining the association between the nurse work environment and patient satisfaction have found higher satisfaction levels where nurses practiced in higher-rated work environments [39, 40].

Additionally, hospital structures and processes have to be developed to enable coproduction within a culture of PCC, i.e., to create partnerships between patients and health care professionals [41]. Recognizing PCC‘s importance regarding high-quality healthcare, several organizations have supplied recommendations on how to develop PCC-focused interventions at the structural level [42, 43]. The Picker Institute (2008) published a PCC improvement guide with strategies to support PCC, e.g., by defining the role of leadership in providing PCC [25]. Furthermore, they describe strategies for building a patient-centered culture via communication, personalization and continuity of

care. However, few of their recommendations are based on evidence about the proposed strategies‘ effectiveness.

On the macro level, PCC-related measures commonly focus on pay-for-performance and provider profiling policy. Provider profiling is the comparison between providers (e.g., hospitals, units or individual clinicians) with the aim of ranking them by performance [44]. Their rankings then serve as the basis for allocation of funds and performance-based pay. However, the patient experience surveys used for profiling–often PCC measurements–tend to yield very low between-provider variance [114], i.e., they distinguish very poorly between higher- and lower-performing hospitals. Therefore, the accuracy of any rankings based on their results is dubious [114].

Heterogeneity
The measurement of PCC provision is complicated by numerous confounders, including heterogeneity in health care settings (hospitals, nursing homes), service lines (medicine, geriatric, pediatric, psychiatric), types of care provided (admission, discharge) and inpatient characteristics (age, diagnosis). For example, in hospital units for patients with dementia, the PCC activities required obviously differ substantially from those in a pediatric acute care unit. Although the two core elements ((1) respect for patients‘ preferences and (2) decision-making based on patients‘ values as the basis for the caring process) are represented in both examples, other care principles and processes vary. Furthermore, depending on the focus of the intervention (e.g., on one or more PCC dimensions), both the intervention itself and its outcomes naturally vary.

Patient characteristics also play a key role in PCC provision. For example, a recent German cross-sectional study investigated the factors influencing patients‘ perceptions of individualized nursing care. In line with previous patient satisfaction research, better self-rated health status and educational level $\leq$ 9 years were associated with higher individualized nursing care ratings [28]. However, when an American secondary data analysis of patient PCC perceptions using the Oncology Patients‘ Perceptions of the Quality of Nursing Care Scale to focus on patient characteristics‘ influence on care ratings, the researchers found no associations between either gender or age and nursing care ratings; however, educational levels showed contradictory influences on patient ratings of PCC in oncology [26]. In addition, Krupat et al. (2001)found that male patients, patients with high school degrees or less and patients aged 60 and older experienced less patient-centeredness than younger, more educated, and female groups [27]. Apart from these demographic factors, patient preferences and expectation of their hospital stay displayed normal inter-patient heterogeneity.

One plausible explanation for these results is that, while patients base their preferences and expectations on their beliefs, values and needs, these are also influenced by their demographics [45]. For example, older patients tend to have fewer unmet expectations than younger ones [46]. Wherever patients‘ expectations originate, though, the more of them are met, the more positively they rate their experiences with care [47, 48].

1.4 Theoretical reflection: How quality improvement could steer PCC

Berwick et al.‘s quality improvement framework is a key structure regarding this dissertation, as it presents a map linking PCC measurement with improved care practices [49]. Between the two, Berwick describes two pathways: (1) improvement through selection (pathway I) and (2) improvement through change (pathway II) (see Figure 1.2). Both paths include provider performance assessments (i.e., hospitals) and have the same overall aim–the improvement of PCC–but work in different ways. Optimally, they should

be seen in combination rather than "either/or" options. To follow the chronological order of the papers in the dissertation, this section deals with pathway II first.

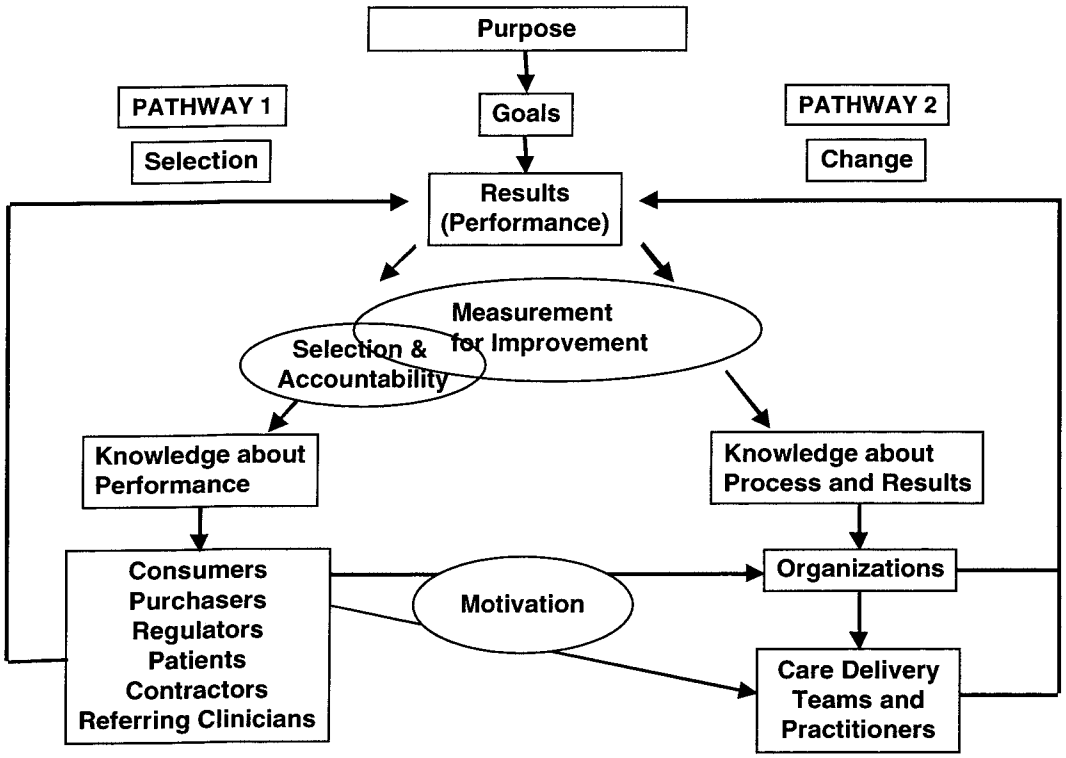

Figure 1.2: Berwick et al.'s quality improvement framework (2003)

1.4.1 Quality improvement through change

Along the *change* pathway, PCC measurement is aimed at gaining knowledge and understanding regarding relevant organizational (e.g., hospital) structures and processes. Effective measurement provides answers regarding which areas work well and which could benefit from improvement.

Providing and improving PCC involves two levels of change: (a) organizational change [25]; and (b) cultural (structural) change [49]. Cultural change means moving from a paternalistic (top-down) view of care to partnerships (lateral relationships) between care providers and patients [41]. Organizational changes focus on meso-level factors, i.e., department- or hospital-wide processes and structures. To improve these, it is first necessary to assess them. For example, while relevant structural variables include hospital characteristics such as size, ownership status and type, they also include work environment factors such as leadership. Culture change comes later, and is accompanied and supported by structures such as timely review and assessment, strong leadership and inclusion of external stakeholders [49, 50]. Naturally, a clear understanding of the hospital structures and processes relevant to the change pathway is useful for pathway selection.

1.4.2 Quality improvement through selection

Besides reshaping clinical practice itself via adjustment of structures and processes, Berwick discusses another pathway to improved quality of care: *selection*. Based on measurement/ranking of providers (e.g., hospitals) according to their performance, the higher-ranked provider will be selected to provide more services, along with more funding. Ranking information is useful to stakeholders such as patients, purchasers and health care policy makers [49]. For example, while health insurance providers will be more interested

in the change route, as it leads to optimization of structures and processes, thereby controlling care-related expenditures, well-informed patients will use performance data to select the hospital that best fits their situation. The process of comparing providers is known as provider profiling and is commonly used for benchmarking. It can also help to identify positive and negative deviants, i.e., high (positively) or low (negatively) performing providers. Using the positive deviant approach [51, 52], lower ranked hospitals receive the opportunity to learn from their higher-ranked peers.

Via the selection pathway, quality of care is not improved directly, but rather by motivating institutions to develop steering mechanisms to improve the quality of their health care. In theory, rank-based selection is an excellent long-term path to improvement. However, improving quality through selection presupposes the ability of the measurement system to detect differences between providers. In the case of patient experience ratings – the metric currently used to assess quality indicators – between-provider variance is limited; therefore, this capacity is not yet clear.

1.5 State of research in the field of PCC

1.5.1 Measurement of PCC

Examining current levels of PCC, thereby determining both starting points for change and bases for selection, demands well-defined outcome measures. However, no standard measurement instrument is yet available [13]. Some versions use questionnaire surveys to measure PCC in different health care settings; others depict the overall concept [53, 54]; still others focus only on selected dimensions [13, 55, 56]. While most measure patients‘ PCC experiences from patient perspectice [53, 57-59], also clinician‘s perspective [60] or the combination of both patient and clinician data [13, 61] is available. Many of these instruments have been tested psychometrically in specific settings but require adaptions for different diseases and countries [26, 62-64]. The popularity of instruments assessing PCC on various levels, for different populations and in diverse health care settings has even led to a range of instruments which are labeled or referred to as PCC questionnaires, but which focus primarily on patients‘ experiences in general. One example is the HCAHPS [65], which was developed to measure patients‘ experiences in general in various settings. Even though it does not include vital dimensions of PCC, e.g., patient individual preferences or involvement in treatment and care decisions, many researchers refer to it as a PCC survey [66].

Notwithstanding the above, even while patient experiences in general are known to be sub-optimal for gauging PCC performance, they are widely used to assess improvement potential for quality of care. This is particularly true in the US, where the HCAHPS survey is very popular. In the UK, the most commonly accepted performance measure is the National Health Service (NHS) Adult Inpatient Survey. Based on the Picker Patient Experience Questionnaire (PPE-15) [58, 67, 68], the NHS survey is driven by PCC principles [42], but still omits any measure of patient preferences. In Switzerland, it is common for patient experience surveys to include items from the HCAHPS and the PPE-15 [69-72]. In fact, however broad a range of stakeholders are discussing PCC, measuring PCC and developing interventions intended to improve PCC, none of the most used PCC instruments measure patient preferences.

Evaluating whether patients‘ needs are met requires two elements: an assessment of their preferences and a comparison between those and their ratings of the care they actually received. A balance between these two parameters indicates provision of high levels of PCC; an imbalance indicates that patient needs were not met, i.e., that lower levels of PCC were delivered. As this approach allows individual patients to register their preferences, its use will both shed light on a core PCC dimension and correct a major shortcoming of current PCC conceptualization.

A further problem is the limited evidence upon which to base selection of patient experience instruments for profiling purposes. Although validity (content, construct or structural) and reliability (internal consistency, measurement errors) are commonly tested [69, 73], none of these indicate a test‘s capacity to distinguish between low- and high-performing hospitals, units or clinicians. Especially when used as macro-level tools to benchmark hospitals or units, sufficient between-provider variability is essential to ensure fair and reliable results.

1.5.2 The association between PCC and outcomes

As shown in Figure 1.1, PCC is associated with different outcomes at the macro, meso and micro levels.

Patient-related outcomes (micro level)
The provision of PCC improves patient experiences with health care and is positively associated with increasing levels of patient satisfaction [3, 12]. However, the evidence is inconsistent regarding its relationship with other patient reported outcomes. Studies of diverse patient populations show no increase in self-efficacy following PCC provision [74, 75]; others have examined the improvement in self-efficacy for diseases such as type 2 diabetes and acute coronary syndrome [63, 75, 76]. For patient quality of care, research is similarly inconsistent [74, 77, 78].

Clinical and economic outcomes (meso level)
Conflicting results are also common regarding clinical and economic outcomes. On the one hand, systematic reviews and individual studies assessing the effects of PCC interventions find reductions in unplanned visits and re-admission rates in their intervention groups [4, 76, 79-81]. On the other, studies correlating PCC with mortality rates have produced varying results [3, 4, 74]. Because clinical outcomes influence economic outcomes, the evidence is similarly inconclusive regarding PCC interventions‘ relationship with cost effectiveness: some studies report that cost reductions accompany PCC interventions [4, 81, 82]; others reject such claims [77, 83].

Policy outcomes (marco level)
Policy (macro-level) outcomes cannot be measured directly. Instead, micro- and meso-level intervention outcomes are commonly used to assess and gauge their success, i.e., for institutional benchmarking and accreditation. For example, routine patient experience ratings regarding their hospital stay are used as one basis for hospital performance comparisons. On these grounds, hospitals are categorized as high- (positive deviants) or low performing (negative deviants). The resulting classifications influence how health care policies such as pay-for-performance programs are implemented. For example, 25% of hospitals‘ total performance scores are based on patient experiences (assessed via the HCAHPS) [10], determining 1.75% of overall hospital payments from Centers for Medicare and Medicaid Services [11].

Further, programs such as the American Nurses Credentialing Center‘s Magnet Recognition Program use hospital provider profile data to promote quality improvement regarding not only patient reported outcomes, processes and structures but also economic outcomes [84, 85]. Magnet hospital research is a practical example of how benchmarking in health care can lead to quantifiable improvements in the quality of health care, e.g., significantly lower thirty-day mortality and failure to rescue [85, 86].

Additionally to benchmarking, micro- and meso-level outcome data are used for hospital accreditation in over 70 countries, including Switzerland [87]. The central aim of hospital accreditation is the improvement of health care quality via adherence to standards and guidelines [31, 87, 88]. In the U.S., hospital accreditation also influences healthcare

reimbursement; and in Switzerland, health care providers need to fulfill specific quality standards (e.g., safe surgery and safe medication) to receive reimbursement [88].

1.5.3 What improves the provision of PCC

Following Berwick‘s conceptual framework, improvement can occur along two pathways: via changes in clinical processes and structures or via quality-based selection, which would lead both to quality promotion incentives and to quality-focused steering mechanisms.

Previous studies have identified the influences processes and structures exert on patient outcomes: changes, e.g., in staffing levels or leadership strategies, can improve patient outcomes. Regarding the implementation of PCC culture, studies have revealed the importance not only of appropriate leadership [31, 32], but of sufficient teamwork [32] and adequate staffing and resources [89, 90]. It is undisputed that both dynamic leadership and staffing and resource adequacy increase patient satisfaction [91, 92]. Conversely, the negative influence of rationing of nursing care on patient outcomes has been investigated and confirmed in several studies [93-95]. However, these studies focused primarily on patient satisfaction rather than on the PCC construct as a whole.

Alongside change, improvement through selection can be enacted via benchmarking and hospital comparison. For example, since 2009, the Swiss Swiss National Association for Quality Development in Hospitals (ANQ) measure has been used to assess patient hospital stay experiences. However, since 2009, the results show neither trends nor significant changes; with few exceptions, hospitals receive extremely high patient experience ratings [96]. If such low variability indicates converging quality of care and generally top-class health care practice, it is clearly a desirable outcome. However, if it simply indicates that the measure is not sufficiently sensitive to detect between-provider differences, the measure requires improvement.

In order to determine the measure‘s capacity to distinguish performance differences beyond noise, the within- and between-provider variance levels it returns are extremely important. Quality indicators used for provider profiling also need to withstand methodological challenges. A range of assessment criteria are important to determine the suitability of a quality measure such as patient experience, e.g., whether the measure fulfills stakeholder needs or can deal with a range of risk profiles [97].

Furthermore, all indicators have to meet methodological requirements. Common psychometric assessments, i.e., validity and reliability, are essential for all items. However, for the development, application and analysis of quality indicators (including questionnaire items) to be used for provider profiling, both between-provider variance and signal-to-noise ratio must also be assessed to indicate whether relevant differences can be detected. The results of such assessments need to be included as standard components of provider profiling publications.

1.5.4 PCC in Switzerland – What is the current state?

Switzerland‘s health care system is ranked among the highest in the Organisation for Economic Co-operation and Development (OECD) [98]. This is reflected in overall health indicators for Switzerland. Together with Spain, Switzerland has Europe‘s highest life expectancy at birth (assessed in 2014) – 83.3 years, compared to a mean of 80.9 years for all EU member states [99]. In addition to positive quantitative assessments of clinical outcomes in Switzerland, national-level perceptions of overall health are very high: in 2016, 79% of Swiss residents rated their health status as ‘good’ or ‘very good’ [99]. Ranked behind only Ireland and Sweden among European health care systems, Switzerlands overall ratings class it as a positive deviant [99].

Furthermore, national and international studies clearly indicate that Swiss patients are very satisfied with their hospital care. The cross-sectional multi-country RN4CAST

study confirms a high level of care [100]. Of almost 1000 hospitalized patients included in the analyses, 60% gave their hospital the highest possible rating (on a scale of 0-10), while 78% would definitely recommend their hospital to family and friends [38]. Compared to the other eight participant countries, these gave Switzerland the highest recommend hospital and second-highest high score ratings for satisfaction with hospital stay [38]. Similarly, high national-level assessments by the Swiss National Association for Quality Development in Hospitals and Clinics and the Rationing of Nursing Care in Switzerland study (RICH Nursing study) confirm high levels of patient satisfaction in Switzerland [96, 101].

In 2017, the Swiss ANQ used their self-developed "ANQ patient satisfaction short survey". This questionnaire currently consists of six questions asking for general ratings of care quality, perceived communication and information (including the possibility of asking questions, receiving understandable answers, and receiving information about medication), and discharge preparation including the length of hospital stay [96]. Although the ANQ questionnaire assesses the PCC dimensions of "communication" and "information", it omits those of "patient as a unique person", "patient involvement in care" or "patient empowerment". Nevertheless, patients ratings for these questions are mostly very positive. Reasons for the positive results are diverse, e.g., with few constraints, patients have free choice of and access to service providers (e.g., general practitioners and specialists, hospital care) [98]. However, nurses' high ratings of their working environments in acute care hospitals confirm adequate staffing and resources, enabling clinicians to provide high quality care, clearly add to the patients' positive ratings [93, 102]. Another reason for such high health care ratings is the amount of money Switzerland spends on its health care system. Switzerland's annual per capita health care expenditures are almost double the OECD average ($US 4003) [102].

In 2012, with the aim of simultaneously improving the quality, transparency and efficiency of hospital care, Switzerland adopted a diagnostic-related group (SwissDRGs) system of calculating charges for acute care hospital services [103]. In the interests of long-term financial sustainability, policymakers also hoped to decrease health care expenditures – first, by simplifying the comparison of inputs and outputs regarding the services they provided, and either increasing the number of cases treated or (2) reducing the services per case. [103]. At least one benefit of the SwissDRGs' introduction is readily discernible: the average length of hospital stay decreased from close to 10 days in 2002 to 5.4 in 2016 [104]. While this represents considerable savings, not all costs fell: in acute care, the average cost per day of hospitalization increased from approximately 1500 CHF (2002) to more than 2000 CHF in 2016 [104].

In its choice of implementing DRGs, Switzerland capitalized on other countries' experience: the US introduced DRGs in 1980; Germany introduced them in 2003. While learning from the American and German experiences, Switzerland can adapt the system to fit its setting. In addition to improving economic outcomes by stabilizing health care expenditures, DRGs should foster increased efficiency and quality of hospital care [103, 105, 106]. In Switzerland, research on the introduction of SwissDRGs is still underway. Ongoing studies focus on nurse outcomes such as moral distress and workload, and on patient hospital stay experiences [107, 108]. This brings the discussion back to PCC. Areas of improvement need to be identified, both through peer comparison (beginning with reliable measurement) and through identification of processes and structures that improve PCC provision.

1.6 Research gap and rational of this dissertation

This dissertation will address two major research gaps in the international health care literature: (i) the lack of information about which structure- and process-related factors are associated with PCC; and (ii) the lack of adequate PCC measures (including patient preference items) for fairly and reliably benchmarking hospital providers.

First, on the meso and micro levels, as the majority of available studies use heterogeneous methodologies and diverse measurements, it is difficult to generalize or compare their results [79, 83]. Understanding the effects of PCC on selected outcomes will require high quality intervention studies using standardized instruments and methodologies [3, 37, 74, 83]. While national and international studies primarily focus on staff-level interventions to improve PCC (e.g., communication skills and relationship building), the literature is unclear regarding the effect of meso-level PCC measures [29, 30]. No study has yet examined the associations between meso-level factors, (i.e., hospital- and unit-wide processes and structures) and PCC. To improve the provision of PCC via Berwick‘s change pathway, possibilities for change must first be identified. Therefore, the assessment of hospital structures and processes that potentially influence PCC delivery and patient perceptions of it are important. To date, a number of studies have explored the association of structure- and process-related factors with patient satisfaction, but not with PCC. Such evidence will be crucial to inform quality improvement strategies and interventional research on potential facilitating factors or barriers to implementing PCC strategies in hospitals and units.

As noted above, PCC can also be improved through the pathway of quality-based selection. For this to be reliable, though, adequate PCC-focused measures for hospital provider benchmarking, i.e., comparison and categorization of hospitals, must be developed to accurately differentiate between low and high performing care providers. While previous studies have used patient experience items for benchmarking to identify positive and negative deviants for various purposes, no study has yet assessed whether the items are suitable for profiling purposes, i.e., whether they are adequate to identify and differentiate between positive and negative deviants. Because PCC items are also used for benchmarking based on levels of PCC in hospitals, it is also necessary to investigate whether those items are appropriate for provider profiling purposes.

Perhaps most importantly regarding PCC provision, the current conceptualization of PCC is far too vague, resulting in unclear measurements and unusable survey data resulting in unclear measurements and unreliable profiling data. While researchers have acknowledged the importance of gauging patient experiences against their preferences for almost two decades, preferences are still not considered in any widely-used patient perception assessments regarding PCC [109]. The assessment of patient preferences is a prerequisite to any understanding of how fully they have been met. It is essential to consider them as a predictor variable while assessing PCC levels.

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Chapter 2

Study aims

The overall aim of this dissertation is (1) to identify structures and processes associated with PCC, (2) to identify potential differences in PCC provision between units and hospitals via advanced statistical methods and (3) to explore opportunities to improve PCC measurement. Furthermore, the evidence provided within this dissertation can be used to begin the process of identifying quality improvement strategies for both change and selection improvement pathways. These contributions are applicable nationally and internationally.

As this dissertation is embedded in the Matching Registered Nurse services with changing care demands (Match^{RN}) study, the study protocol is included in this dissertation. It describes the rationale, aims, design and methodology, including setting and sample, as well as the relevant variables, measurements and data collection techniques of the Match^{RN} study (Chapter 3).

Based on the gaps identified in the scientific literature, this dissertation examines the following specific aims:

Patient-centered care, the nurse work environment and implicit rationing of nursing care in the Match^{RN} sample (Chapter 4)

- To describe the level of PCC in Swiss acute care hospitals;
- To examine the associations between PCC, the nurse work environment and implicit rationing of nursing care in Swiss acute care hospitals.

Insufficient variance between providers using patient experiences surveys: methodological considerations and findings from a Swiss multicenter study (Chapter 5)

- To describe the computation of the two types of the intra-class correlation to assess between-provider variability and reliability;
- To calculate both intra-class correlations in an empirical example of patient experience data in a national sample of Swiss acute care hospitals;
- To evaluate the appropriateness of several items in the empirical example.

Preferences matter when measuring patient experiences with hospital care - A cross-sectional multi-center study (Chapter 6)

- To assess levels of PCC in Swiss acute care hospitals;
- To assess patient preferences for selected care aspects in Swiss acute care hospitals;
- To examine between-provider variance for patients experience with PCC by controlling for patient preferences and patient and hospital characteristics.

Chapter 3

Matching Registered Nurse services with changing care demands (Match^{RN}): study protocol of a natural experiment multi-centre study

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3.1 Abstract

Aim. The aim of this study was to examine how patient safety indicators and processes and structures of nursing care have changed since the 2012 introduction of Swiss Diagnosis-Related Groups.

Background. Diagnosis-Related Groups have been implemented worldwide; yet, research findings regarding their impact on efficiency and quality of care remain inconsistent. The Matching Registered Nurse Services with Changing Care Demands study will assess how structures, processes and patient and nurse outcomes have changed in Swiss acute care hospitals since the introduction of Swiss Diagnosis-Related Groups.

Design. A multi-centre observational study nested in a natural experiment. Methods. To explore the effect of implementing Diagnosis-Related Groups in Switzerland we will compare nurse and patient survey data from 2010 with data from 2015 and eventually from 2017. Initially, we will match survey data from 78 medical and surgical units of 21 hospitals that participated in 2010 and 2015. Study variables related to structures and processes of nursing care (e.g. staffing/ skill mix level, nurse work environment, rationing of nursing care), as well as patient and nurse outcomes, were assessed with well-established instruments. In 2017, a follow-up survey will be conducted to explore long-term implications. Furthermore, 6 years' medical and surgical patient discharge data (collected 2010–2015) will be analysed to assess changes in the severity of patient illness, length of stay and selected patient safety indicators.

Discussion. This study's results will provide evidence regarding Diagnosis-Related Groups influences on Swiss nursing services and patient safety outcomes.

3.2 Introduction

For more than 30 years, activity-based funding systems such as Diagnosis-Related Groups (DRGs) have been implemented in healthcare systems worldwide to improve transparency, efficiency and quality of hospital care. Increased transparency is achieved by grouping patient health conditions and medical diagnostic or treatment procedures into categories, thereby allowing comparison of provided services' inputs and outputs. Increased efficiency is expected because DRGs incentivize hospitals to increase their financial sustainability either: (1) by increasing the number of patient cases treated; or (2) by reducing the services per case [1]. Improved quality of care, including patient safety [2, 3] is also expected because hospitals, in their efforts to become more efficient, attempt to improve clinical processes and care management [4]. However, clear evidence with consistent results regarding DRGs' effects and impacts on efficiency and quality of care are lacking. This study protocol describes the Match^{RN} study, which will examine how, alongside processes and structures of nursing care, patient and nurse outcomes have changed since the DRGs were introduced in Switzerland.

3.3 Background

In 2012, Swiss Diagnosis-Related Groups (SwissDRGs) were implemented nationally for acute care hospital services in Switzerland. This implementation can be considered a natural experiment, i.e. an event neither planned nor manipulated by researchers, yet reflecting an independent variable influencing one or more dependent variables [5]. Because the implementation decision was made at the cantonal and federal levels, two major criteria of an experimental trial-random assignment and a researcher- controlled intervention, are unattainable.

3.3.1 Quality of the Swiss Healthcare System

Whether observed on its own or in comparison with other countries, the Swiss health system operates at a high level, e.g. regarding patient access to care, health workforce staffing [6-8]. In 2010, Switzerland participated in the international RN4CAST study. A total of 488 acute care hospitals in 11 European countries and 617 more in four US states were included in the sample. In Switzerland, roughly 1600 nurses and 1000 patients from 35 hospitals were surveyed. By international standards, Swiss hospitals demonstrate high quality of nursing care or high levels of patient safety and a good work environment quality, with high overall nurse work satisfaction [6, 7]. On a scale of 0 (worst) – 10 (best), 60% of participating patients rated their hospitals 9 or 10, with 78% reporting that they would recommend their hospitals to their families and friends [6]. The Commonwealth Fund International Health Policy Survey (2011) found that, in a sample of 1500 sicker adults, 69% were satisfied with the Swiss care system [8]. Switzerland's nurse to patient ratio, which averages one registered nurse per 7 9 patients, is high compared with other countries, leading to high patient satisfaction [6]. All results above are based on studies conducted before the introduction of SwissDRGs in 2012.

3.3.2 Implementation of the DRGs in Switzerland

Before the implementation of SwissDRGs in Switzerland's 26 Swiss cantons in 2012, four different payment schemes were in use [9]. The first, 'process- and performance-based pricing' (PLT, Prozess-Leistungs-Tarifierung), stipulated a fixed amount to be paid prospectively per admitted patient per day. The second, 'All Patient Diagnosis-Related Groups' (APDRGs), was a prospective payment per case system similar to DRGs, but with an 'additional per diem rate to cover nursing and catering services' [9, p. 77]. Compared

with PLT, APDRGs allowed more precise resource calculation because of specific case weight consideration [9]. Third, 'department case-based payments' (DCPs), like PLT, used a fixed prospective amount per patient according to the involved department, without the additional per diem rates charged with APDRGs. Fourth, per diem reimbursement' was also a prospective system based on the days the patient stayed in hospital. Concerning the characteristics of these payment systems, they could be grouped into two main categories: (1) payment per case (APDRG and DCP); and (2) payment per day (PLT and per diem).

3.3.3 Effects of DRGs

Although international research on the effects of DRGs is available, there is no clear evidence on their impact on healthcare structures, processes and outcomes. A systematic review investigate the impact of active-based funding systems on patient mortality, hospital readmission rates and discharge to post-acute care settings (e.g. homecare), along with hospital patients' severity of illness and volume of care, compared with that of non-active-based funding systems [10]. Sixty-five studies (59 with before/after designs, three parallel groups designs, three with before/after and parallel designs) were included in the review. No differences were found regarding mortality; however, where active-based funding systems were used, the authors found increased patient discharges to post-acute care settings as well as higher levels of illness severity in hospital patients [10]. The findings on increased severity of illness indicate that hospitals reduced length of stay (LOS), i.e. by treating patients only during periods of acute illness. Several studies support this finding, including a pre-post study in 297 US hospitals, which pooled data from over 14,000 patients with congestive heart failure, acute myocardial infarction, pneumonia, cerebrovascular accident, or hip fracture and compared patient outcomes before and after the implementation of DRGs. While that study found no differences regarding mortality rates, it did indicate a 24%. LOS reduction following implementation of DRGs [11]. Similar reductions in LOS have been reported by other American [12, 13] and European studies [1, 14]. However, results regarding patient satisfaction are inconsistent. For example, of three studies examining the effects of DRGs on patient satisfaction with quality of care, two reported lower satisfaction following DRG implementation [15, 16], with the third reporting no change [14].

Few studies have investigated DRGs' impacts on nursing care structures and processes. A before/after study examined the effects of the German-DRG system on nurses' practice environments, job satisfaction and emotional exhaustion levels over a period of 10 years [17]. In addition to decreases in nurse staffing issues, their results indicated that, while the quality of collaboration between nurses and physicians increased overall, it decreased concerning perceived respectful and cooperative relationships between the two groups. In addition, following the implementation of DRGs, emotional exhaustion among nurses doubled (from 15% to 30%) and dissatisfaction with the nursing profession increased by 40% [17]. Furthermore, three consecutive nurses surveys – from 2003, 2006 and 2008 – found similar results in Germany and confirmed increasing incongruity between nurses' perceptions of high quality care and the actual care they could provide [18]. Although research examining the effects of DRGs is limited, the available evidence suggests negative effects on nurse-sensitive patient outcomes and possibly on patient safety.

For Switzerland, few studies have investigated the potential impact of SwissDRGs' introduction, little evidence exists on DRGs' impacts on structures, processes and outcomes relevant to nursing care quality. As the few available studies are limited by their use of parallel group designs before the national introduction [19, 20], small organizational-level samples [16, 21], or descriptive cross-sectional designs investigating professionals' perception [22, 23], they permit no sound conclusions regarding changes in

the outcomes of interest. Match^{RN} will examine how processes and structures of nursing care, as well as patient and nurse outcomes, have changed following the implementation of DRGs in Switzerland and how services can be organized to best respond to changing care demands.

3.4 Aims

The four specific aims of Match^{RN} are:

- To describe how the structure of Swiss nursing services (e.g. staffing) and the nursing work environment (e.g. leadership) changed following the introduction of SwissDRGs;
- To describe how processes of nursing care (e.g. rationing of nursing care) changed following the introduction of SwissDRGs;
- To explore how the case mixes of nursing departments (e.g. severity of illness) and nurse-sensitive patient safety indicators (e.g. postoperative complications) changed following the introduction of SwissDRGs; and
- To explore the impact on nursing structures and processes and on outcomes for nurses (e.g. job satisfaction) and patients (e.g. patient safety indicators) following the introduction of SwissDRGs.

3.4.1 Conceptual framework

This study‘s conceptual framework (see Figure 3.1) is based on structural contingency theory [24], Donabedians Quality Framework [25] and principles of Lean Management [26]. How organizations respond to a major health policy change such as the implementation of DRGs can be described via structural contingency theory [24]. This perspective assumes that organizations fit with their environments (e.g. hospitals fit into the healthcare system), although close fits require adjustments to those environments. In the healthcare context, the quality of an organization‘s fit is expressed by its performance, e.g. a hospital‘s level of safety and quality of the care (nurse and patient outcomes) and the efficiency of its service (i.e. on the levels of structure and process) [27].

Considering research from other countries using DRGs, one expected consequence of the SwissDRG implementation is that patient case mixes will include increasing levels of illness severity, reflecting reductions in LOS. As open systems, hospitals have functional mechanisms to fit them to their environments, i.e. they develop diverse structures and processes to adapt and attain the required performance levels.

Performance in healthcare is commonly described using Donabedian‘s Quality Framework, which includes three dimensions of care quality: structures, processes and outcomes [25], overlapping somewhat with structural contingency theory. On the structural dimension, cost containment measures could lead to an overall reduction of nurse staffing, or replacement of qualified staff with less qualified staff [28]. Nurse staffing, including skill mix, has been associated with patient outcomes including mortality, failure to rescue and patient experience with hospital care [29, 30]. Different models of nursing care organization, e.g. the functional or professional model, have been linked to patient safety outcomes such as medication errors or falls [31]. On the process dimension of care quality, organizational efforts to develop new processes or redesign existing ones are very likely.

One way of describing processes in health care is via the principles of lean management, e.g. value, flow and perfection [26]. Value is represented by a service’s levels of accessibility and patient-centredness [32]. Flow refers to the smoothness of the

service's operations, which can be measured by waiting times. For example, failures in level scheduling can lead to rationing of nursing care, which has been associated with negative patient outcomes [33]. Finally, perfection reflects the attitudes and behaviours of nurses to prevent errors, which is expressed, e.g. by the patient safety climate [34].

Hospitals need to adapt to the DRG introduction by re-organizing their structures and processes of nursing care. Work environment factors, such as organizations readiness and behaviour in response to change [35] and a supportive nursing practice environment, including, e.g. strong leadership and inter-professional collaboration [36], are important to maintain or regain fit to their changing environments. Adaptations of nursing service structures and processes are associated with patient outcomes [37] and processes, structures and work environment factors are associated with nurse outcomes such as burnout [38] and intention to leave [39], which have long-term consequences regarding healthcare work-force sustainability.

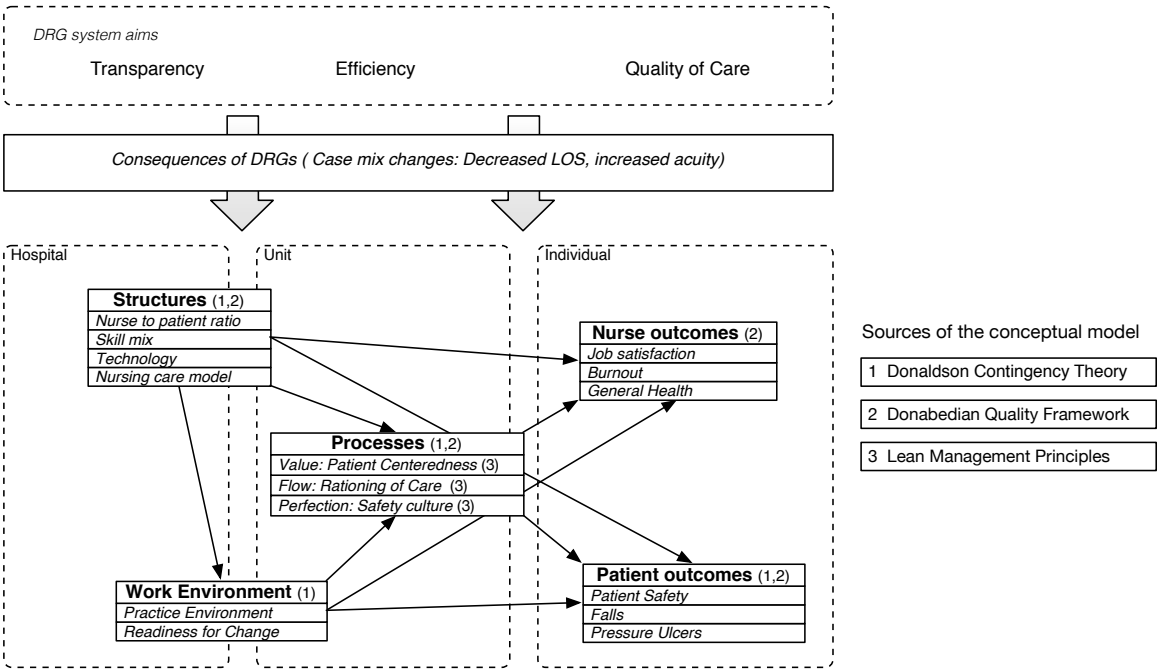

Figure 3.1: Conceptual model of DRG impact on nursing services' structures, processes and outcome

3.5 Design and methodology

Match^{RN} is a 4-year health service research project (2015-2018) to evaluate the effects of SwissDRG implementation in a national sample of acute care hospitals. The study is observational, with multiple data collection periods (2010, 2015 & 2017) and approaches the introduction of SwissDRGs as a natural experiment. Regarding the various reimbursement systems used prior to the nation-wide SwissDRG implementation (see Table 3.1), hospitals were classed as either under 'DRG-treatment or as control.

Table 3.1: Swiss payments system in 2010 with the number of hospitals, units (divided in identical with RN4CAST and all together in Match^{RN}) and expected nurse and patient questionnaires for Match^{RN}

Payment system in 2010	Hospital	Units	Nurses	Patients
APDRG	8	32	970	1350
DCP	1	4	280	200
PLT	10	34	1475	1850
Per diem	2	8	315	560
Total identical RN4CAST & Match^{RN}	21	78	NA	NA
Total in Match^{RN}	23	124	3,040*	3,960

APDRG All Patient Diagnosis-Related Groups, *DCP* department case-based payments, *PLT* process- and performance-based pricing, *RN4CAST* data collection in 2010, *Match^{RN}* data collection in 2015, * expected

Because of variations in cantonal health policy, the assignment to the two groups followed an 'as if randomization. Match^{RN} combines 2010 (pre-DRG implementation) patient and nurse survey data from the Swiss arm of the RN4CAST study [40] with post-DRG implementation follow-up data collected for Match^{RN} in 2015 and 2017. The resulting datasets will allow examination of short- and long-term post-implementation changes in structures, processes and outcomes of nursing care. Moreover, Match^{RN} uses – and will use – routine discharge data provided by the Swiss Federal Statistical Office to assess changes in levels of severity of illness, LOS and patient safety indicators (PSIs), e.g. central line-related bloodstream infections of postoperative sepsis, between 2010, 2015 and 2017. Figure 3.2 provides an overview of how the study's four aims and various ongoing data sources are interrelated and will inform one another (data collection from 2017 in Figure 3.2 excluded).

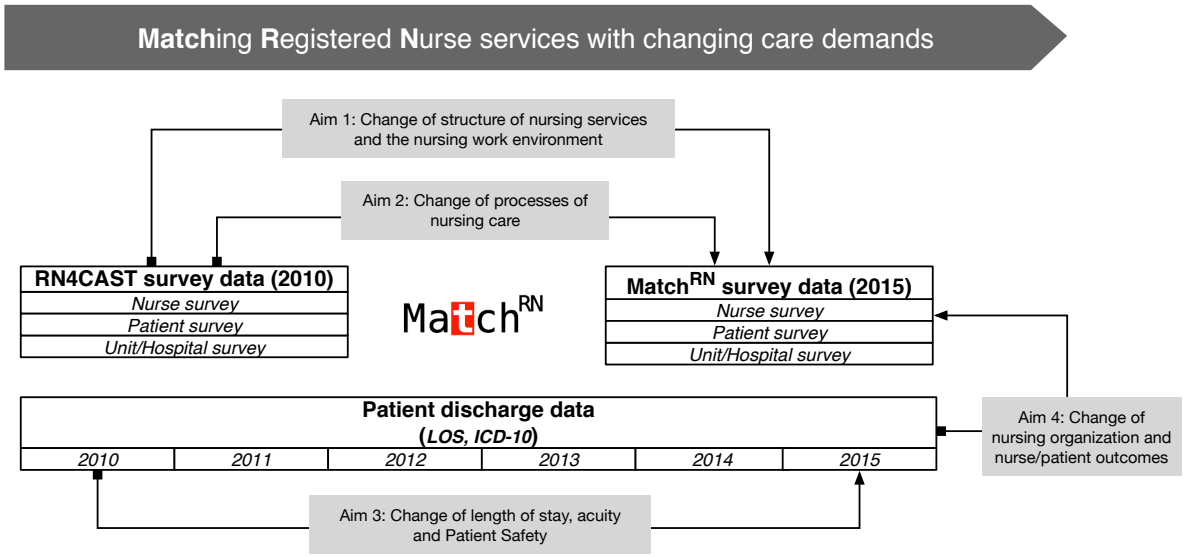

Figure 3.2: Study aims and relationships between data sources (data collection and sources for 2017 not yet extant).

3.5.1 Setting and sample

The study takes place on medical and surgical hospital units. These units serve the highest numbers of patients and the science of measuring structures and outcomes in nursing services is the most advanced in their service lines [41].

Baseline (pre-SwissDRG implementation) nurse and patient survey data from 2010 were originally collected for the Swiss arm of the RN4CAST study [40]. To collect DRG

post-implementation data, we surveyed nurses and patients in the same units and hospitals in 2015. In Switzerland, the RN4CAST study applied a quota sampling strategy to include 35 hospitals across the German, French and Italian language regions, representing all types of acute care hospital ranging from small rural hospitals to large university hospitals [42]. In each hospital, the RN4CAST researcher selected a random sample of medical and surgical units (N=132 units). For Match^{RN}, we invited all of the RN4CAST studys 35 participating hospitals, of which 21 (60%) agreed to participate. Of these facilities 132 eligible units, 59% (78 units) agreed to participate. In addition, two other hospitals and 46 units volunteered to participate and were included in the study, but were excluded from specific analyses focusing on the before/after aspects of the study. Because of the RN4CAST study‘s wide range of variables of interest and pre-determined sample, no formal power analysis could be conducted.

Table 3.1 shows the various reimbursement systems used prior to SwissDRG implementation and the number of hospitals and units that contributed to the RN4CAST 2010 data collection. Regarding the two reimbursement categories we used, nine hospitals, including 36 eligible units, used per-case payment, while 12 hospitals with 42 participating units used per-day payment systems. In addition, Table 3.1 depicts the expected number of patient and nurse questionnaires, as well as the total sample of hospitals participating in Match^{RN}. All nurses on the participating units, e.g. registered nurses, certified nurses and nurse aides, were asked to complete the survey. All patients on these units at the time of data collection were also asked to participate, provided they fulfill the inclusion criteria, i.e. they are aged 18 years or older, in sufficiently healthy to participate, have been hospitalized at least 24 hours, understand German, French or Italian, or have not already completed the questionnaire. Nurses of the respective units recruit the patients, while hospital and unit managers collect administrative data in participating units and hospitals. Furthermore, Match^{RN} uses patient discharge data recorded by all hospitals in Switzerland from 2010 to 2015. On the basis of analyses of the RN4CAST studys 2010 data, we expect to include dis- charge data from approximately 300,000 patients for each year (N = 1,800,000 patients). In 2017, a further survey of patients and nurses in the same hospital units will be conducted.

3.5.2 Variables and measurement

Match^{RN} uses variables and measurements from the following six data sources:

Nurse survey
The Match^{RN} survey is based on the RN4CAST survey [40], with modified scales and additional items. For example, quality of the nurse work environment is measured via a modified version of the Practice Environment Scale of the Nursing Work Index [43] and Safety Culture with the Agency for Healthcare Research and Quality (AHRQ) hospital survey on patient safety culture [44], the Safety Organizing Scale [45] and the Safety Attitude Questionnaire (SAQ) [46]. In addition, the sur- vey asks for social demographic data (age, gender, professional experience). The nurse survey contains 177 items across 15 different scales, along with several items revised, adopted and otherwise developed by the Match^{RN} study team. Details can be found in Table S1. The scales used have undergone validity and reliability testing and have been used successfully in previous national and inter- national outcome studies [38, 40].

Patient survey
Match^{RN} assesses patient satisfaction via a revised version of the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey [47], reflecting patient experiences with nursing care and overall hospital care. Our version includes 12 items, reflecting four domains: (1) nurses care; (2) experiences in the hospital including

pain management and communication about medications; (3) received discharge information; and (4) general hospital-related recommendations. Psychometric evaluation of the HCAHPS demonstrated excellent validity (e.g. internal structure) and reliability (e.g. internal consistency) [48]. To reflect patient views on patient-centredness of care processes, we use a revised version of the General Short Patient Experiences Questionnaire (GS-PEQ) with 14 items on patient experiences [49]. In the Match^{RN} study, we will test further psychometric properties of the GS-PEQ. In addition, the patient survey gathers demographic information (age, gender, educational level). Furthermore, with the permission of the EuroQol Executive Office, we included the EQ-5D-3L scale with the five dimensions (mobility, self-care, usual activities, pain/discomfort, or anxiety/depression) and three answer options (no problems, some problems, extreme problems) to assess patient functional status [50]. In total, the patient questionnaire includes 37 items from five different item sources and scales, which were also partly revised and adopted from the Match^{RN} study team. Details of the scales can be found in Table S2.

Unit survey
The self-developed nine-item unit survey assesses organizational characteristics of the participating units, such as size (bed count) and service line.

Hospital survey
The hospital survey (13 items) assesses hospital level characteristics such as staffing, grade mix and staff turnover rates.

Hospital statistics
Hospital statistics provided by the Swiss Federal Statistical Office (Bundesamt für Statistik) will provide information about the facility profile including its bed size, ownership status (e.g. privat, not for profit, public) and type (i.e. district, general, teaching hospitals).

Patient discharge data
We will use routine hospital discharge data collected from all Swiss hospitals between 2010-2015 by the Swiss Federal Statistical Office. Although the necessary data are available in two standard versions, researchers are required to negotiate data use agreements to obtain the data with certain specifications. The planned analyses will be dependent on these data use agreements. Hospital data are anonymized concerning both administrative information on patients (e.g. gender, age) and comprehensive healthcare information, e.g. medical diagnoses and interventions during hospital inpatient stays, as well as discharge information. Match^{RN} will investigate three areas of interest from discharge data:

LOS: the number of inpatient days will be measured by the difference between the discharge and admission dates +1 day. Severity of illness will be measured using the Charlson comorbidity index for ICD-10 codes and the Elixhauser comorbidity index [51]. The c-statistic will be used to select the most valid measure for the PSIs.

PSIs of AHRQ will be assessed using those indicators found most nursing sensitive [3]: (a) central line-related bloodstream infection; (b) postoperative sepsis; (c) postoperative deep vein thrombosis and pulmonary embolism; (d) postoperative respiratory failure and (e) pressure ulcers. The measurement of PSIs is based on an algorithm using International Classification of Diseases, 10th revision (ICD10) codes, including a selection of secondary diagnoses in the numerator (to identify potentially relevant hospital-related adverse events) and DRG, ICD or/and procedure codes (CHOP) in the denominator to define the population at risk [52]. The population at risk in the PSI denominator may vary according to the inclusion and exclusion criteria of the

respective PSIs (e.g. for pressure ulcers, patients with LOS <5 days, with a diagnosis of skin disease in any coding field and who are admitted with the principal diagnosis of pressure ulcer, will be excluded from the denominator).

Survey translation and validity testing
Original English language scales and items, which are not available in German, French or Italian, have been translated first into German using a modified Brislin protocol, a systematic translation process [53]. French and Italian language versions were translated from the German version using forward-backward translation. After this, an expert panel review of bilingual clinical and research nurses fluent in each target language reviewed each item regarding cultural adaptations. To ensure comprehensibility and to check for response patterns, the entire German and French versions of the nurse questionnaire were pilot tested with nurses with a range of educational levels. Likewise, the full German and French language versions of the patient questionnaire were pilot tested with patient volunteers. Experienced nurses reviewed the Italian language versions. For all language versions of both the nurse and patient questionnaires, adaptations were made as necessary for wording and clarity.

3.5.3 Data collection

The data collection followed the same procedures as used in the RN4CAST study [42]. Between September 2015–January 2016, all participating hospitals and units received the questionnaires, including postage-paid return envelopes. Completed questionnaires were either returned directly to the study team by normal post or first collected in boxes placed on each unit, then returned by the unit coordinator.

For the nurse survey, the unit coordinators distributed the questionnaire to all nurses of the participating units. To allow follow-up of response rates and posting of reminders, we asked all participating hospitals to provide the number of nurses employed on each participating unit. For the patient survey, Match^{RN} took a day census approach. In each unit, on two randomly selected working days (with an interval of at least 2 weeks) during the study period, the contact person (e.g. the unit coordinator or a nurse specialist) invited all eligible patients to complete the questionnaire. Each questionnaire included a unit-specific code, allowing us to check response rates. For the patient survey, on units with fewer than 10 responses after two data collection days, a third randomly selected data collection day was permitted.

The unit and hospital managers completed the surveys for their respective organizational levels. A data entry service will manually enter all questionnaire data into a database. Further data collection for the Match^{RN} study will be conducted in 2017 on the same hospital units. Furthermore, we will use hospital statistics and hospital routine discharge data from all Swiss hospitals between 2010 and 2015. This data will be obtained directly from the participating hospitals or from the Swiss Federal Statistical Office after concluding a data privacy contract.

3.5.4 Data analysis

To deal with risks inherent in natural experiments, e.g. ‘selection on observables‘, we will use a regression analysis or propensity score matching approaches. In contrast, ‘selection on unobservables risk refers to situations when variable that cannot be observed directly are associated with the dependent variable but unevenly distributed across the groups (pre-post-SwissDRG implementation). In these situations, instrumental variable, regression discontinuity or difference in differences approaches are suggested [5]. Regression discontinuity designs require a clearly defined step change, which did not occur

with the SwissDRG introduction. Changes to care structures and processes are likely to evolve over longer periods with no clearly defined step change; and some Swiss cantons introduced SwissDRGs before their national implementation in 2012. Another alternative would be instrumental variables [54], which proved difficult to identify in the context of this study. Therefore, a difference in differences approach, which compares changes over time in exposed (SwissDRG) and unexposed (non-SwissDRG) groups, offers the most promising strategy to overcome possible selection bias on unobservables. Consequently, the comparison of changes of severity of illness, LOS, PSIs and nurse outcomes will be possible between cantons with DRGs already implemented in 2010 (parallel design in RN4CAST data) and those that waited for the national implementation in 2012 (RN4CAST data vs. Match^{RN} data).

In accordance with our study aims, Match^{RN} involves the following descriptive and inferential statistics:

Aims 1 and 2
We will compute descriptive statistics to describe the sociodemographic and professional characteristics of nurses and variables related to the structure of nursing services and the quality of the nurses‘ work environment. For these analyses, the study team will complete two basic steps: (1) genetic propensity score matching with balance optimization [55]; and (2) hidden bias assessment with Rosenbaum bounds [56]. The matched analysis will account for clustering at the unit and hospital levels via multilevel analysis [57].

Aim 3
Considering the sample and the types of changes involved in this natural experiment, two types of variation are expected in this study: (1) those between pre- and post-SwissDRG periods; and (2) those between hospitals as random-effect variations. The evaluation examines potential measurement variations that could be explained by various fixed-effect factors related to case mix (e.g. gender, age) and hospital characteristics (e.g. hospital size). We will use hierarchical generalized linear models–an extension of generalized linear models that allows the dependent variables a variety of error structures, including normal, binomial and Poisson distributions.

Aim 4
Using hierarchical generalized linear models, Match^{RN} will assess potential associations between structures and processes of nursing care and three types of outcomes: (1) LOS; (2) PSIs and (3) nurse outcomes (i.e. job satisfaction, burnout and turnover intentions). For statistical analyses we will use open source software R Version 3.3.2 for Mac OS X.

3.5.5 Ethical considerations

Because of the Match^{RN} study‘s observational and anonymous data collection approach, it received exempt status approval from all ethics committees responsible for the 23 participating hospitals, all of which their provided informed consent to participate. Nurse and patient participants received the questionnaire with a covering letter introducing the studys purpose, explaining and guaranteeing the protection of their anonymity and emphasizing that participation is voluntary. To protect the anonymity of all individual participants, we will apply relevant protection mechanisms (e.g. coded dataset numbers, secured data storage). Participation in both the nurse and the patient survey is voluntary; filling out and submitting the questionnaire will be considered as informed consent. Patient discharge data will be requested from the Swiss Federal Statistical Office. As these data are not linkable to any patient names, anonymity is fully guaranteed.

3.5.6 Validity and reliability

Several steps have been taken to ensure the validity and reliability of the study. First, data collection employed established or pre-tested instruments. For scales used for the first time in Switzerland, we will test reliability e.g. using factor analyses and Cronbach's alpha. For translation of the scales, we conducted a systematic backward-forward translation process. For all language versions of questionnaires, we asked experts for feedback to explore face validity. In addition, the questionnaires were pilot tested with appropriate target groups. Second, to deal with common problems of observational studies, the omission of important confounders (e.g. unobserved confounders in one group and the strength of the effect of the unobserved confounder), we will conduct sensitivity analyses to determine the robustness of effects [58] and the extent to which plausible changes of assumptions affect conclusions [56].

3.5.7 Stakeholder involvement

Match^{RN} will build on the RN4CAST project's established stakeholder group, with 'the ultimate goal . . . [of] engaging stakeholders to create a common understanding by soliciting knowledge, experience, judgment and values [59, p. 5]. Since the start of this research project, we have established a panel of more than 15 stakeholders, including regional and national level representatives of nursing, consumer and healthcare organizations.

3.6 Discussion

Benefiting stakeholders in the Swiss healthcare system, including policy makers, hospital managers, healthcare professionals and the general public, Match^{RN} will provide new knowledge on how care has changed in Swiss hospitals since the implementation of SwissDRGs. Such knowledge will provide the basis for policy briefs, deliberative dialogues, public discussions and organizational learning based on the strategies of 'best performing hospitals.

Despite several studies on the implementation of the SwissDRG policy, levels of certainty remain low concerning how DRGs have influenced the overall quality of hospital care regarding structures, processes or outcomes of nursing services. Match^{RN} will help to address this knowledge gap by identifying both changes in nursing practices and how those changes have influenced the quality of patient care. Beginning with a clear perspective on nursing services, including the nursing work environment and patient outcomes, the results will inform the health policy community about DRGs' impact on the quality and safety of Swiss patient care.

3.6.1 Limitation

Because of its natural experiment design and the resulting lack of random assignment, concurrent control groups and researcher-controlled interventions, Match^{RN} has a risk of selection bias (i.e. selection on observables and unobservables). We will address this potential bias by following the Medical Research Councils recommended strategies, including multiple pre/post measures, the use of multiple exposed and unexposed groups, measurement of con- founders and combinations of these methods, as well as analytical approaches, e.g. propensity score matching and difference in differences analysis [60].

3.7 Conclusion

Match^{RN} is a highly relevant and timely health service research project that investigates the impact of the 'natural experiment' of SwissDRG implementation. Based on a large

multi-centre sample of more than 21 hospitals across Switzerlands German, French and Italian regions, the proposed research project will contribute to the literature on DRGs and will allow the expansion of research capacities and collaboration in health services and nursing research.

3.8 Acknowledgement

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3.9 Funding

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3.10 Conflict of interest

No conflict of interest has been declared by the authors.

3.11 Author contributions

All authors have agreed on the final version and meet at least one of the following criteria [recommended by the ICMJE (http://www.icmje.org/recommendations/)]:

- substantial contributions to conception and design, acquisition of data or analysis and interpretation of data;
- drafting the article or revising it critically for important intellectual content.

3.12 Supporting information

Additional supporting information may be found online in the supporting information tab for this article.

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Chapter 4

Patient-Centered Care, Nurse Work Environment and Implicit Rationing of Nursing Care in Swiss Acute Care Hospitals: a cross-sectional multi-center study

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4.1 Abstract

Background: Patient-centered care is a key element of high-quality healthcare and determined by individual, structural and process factors. Patient-centered care is associated with improved patient-reported, clinical and economic outcomes. However, while hospital-level characteristics influence patient-centered care, little evidence is available on the association of patient-centered care with characteristic such as the nurse work environment or implicit rationing of nursing care.

Objective: The aim of this study was to describe patient-centered care in Swiss acute care hospitals and to explore the associations with nurse work environment factors and implicit rationing of nursing care.

Design: This is a sub-study of the cross-sectional multi-center "Matching Registered Nurse Services with Changing Care Demands" study.

Setting: We included 123 units in 23 acute care hospitals from all three of Switzerlands language regions.

Participants: The sample consisted of 2073 patients, hospitalized for at least 24 h and $\geq$18 years of age. From the same hospital units, 1810 registered nurses working in direct patient care were also included.

Methods: Patients perceptions of patient-centered care were assessed using four items from the Generic Short Patient Experiences Questionnaire. Nurses completed questionnaires assessing perceived staffing and resource adequacy, adjusted staffing, leadership ability and level of implicit rationing of nursing care. We applied a Generalized Linear Mixed Models for analysis including individual-level patient and nurse data aggregated to the unit level.

Results: Patients reported high levels of patient-centered care: 90% easily understood nurses, 91% felt the treatment and care were adapted for their situation, 82% received sufficient information, and 70% felt involved in treatment and care decisions. Higher staffing and resource adequacy was associated with higher levels of patient-centered care, e.g., sufficient information (β 0.638 [95%-CI: 0.30–0.98]). Higher leadership ratings were associated with sufficient information (β 0.403 [95%-CI: 0.03–0.77) and adapted treatment and care (β 0.462 [95%-CI: 0.04–0.88]). Furthermore, higher levels of implicit rationing of nursing care were associated with lower levels of patient-centered care, e.g., adapted treatment and care (β -0.912 [95%-CI: -1.50–0.33]).

Conclusion: Our study shows a negative association between implicit rationing of nursing care and patient-centered care: i.e. the lower the level of implicit rationing of nursing care, the better patients understood nurses, felt sufficiently informed and recognized that they were receiving highly individualized treatment. To improve patient-centered care, the nurse work environment and the level of implicit rationing of nursing care should be taken into consideration.

4.2 Introduction

In recent decades patient-centered care (PCC) has gained increasing emphasis from policy makers, researchers and clinicians [1] because of its association with improved patient-reported, clinical and economic outcomes. PCC is recognizing as one of the six key elements of healthcare quality, National Academy of Medicine (NAM, former Institute of Medicine (IOM)) defined PCC as 'care that is respectful of and responsive to individual patient preferences, needs, and values and ensuring that patients' values guide all clinical decisions" [2, p.3]. Also known as individualized or negotiated care [3], PCC is a multifaceted construct involving various systems of operationalization, conceptualization, and terminology.

Based on the NAM definition, PCC's two most basic dimensions involve concerted efforts among healthcare teams 'to see and treat the patient as a unique person' (the "unique person" dimension) and to involve the patient in their care determined by their decisions' (the "involvement in treatment and care" dimension) [4-6]. Both demand a cultural shift from the traditional paternalistic approach to a partnership between clinician and patient. In services, including healthcare services, partnership is also termed coproduction [7], as "patients and professionals interact as participants within a healthcare system in society" [7, p.3], with each participating equally [8]. Normann distinguishes the coproduction roles of business professionals between 'relieving' services and 'enabling' services [9]. This distinction can be transferred to healthcare services, where healthcare professionals both relieve and enable patients. Which of these is appropriate and desired by both patient and professional is context-dependent; however, the patient needs to be involved in all care-related actions and decisions [10]. Optimally, the patient receives clear and understandable information on all relevant care options and decides accordingly. However, in clinical contexts, the involved professionals need to clarify and adjust the levels both of involvement and of information to match the patient's specific needs, capacities, and preferences.

Based on the NAM definition of PCC and in line with previous research [11], in addition to PCCs two fundamental dimensions ((1)"unique person" and (2)"involvement in treatment and care"), two further dimensions, (3)"patient information" and (4)"clinical-patient communication" complete the PCC construct [12] (see Figure 4.1). In order to be involved in decisions regarding their treatment and care, patients need information about the best available evidence [13]. Furthermore, the communication of the information has to be tailored according to the patients needs and situation.

While PCC has a strong relationship with patient satisfaction with care, PCC is clearly not driven by patient satisfaction [14], rather, extensive research using a range of measurements has shown that providing PCC increases patient satisfaction [15-17]. However, PCC also improves other patient-reported outcomes such as patient self-care [18, 19], sense of autonomy [17, 20], self-efficacy [21] and health-related quality of life [20]. Alongside patient-reported outcomes, PCC enhances clinical and economic outcomes: studies have highlighted a growing need for health policy makers and managers to embrace PCC as a key concept of care quality. One retrospective, non-experimental comparison study analyses patients' lengths of stay and care costs between medical and surgical units providing PCC (consisting of 10 core components e.g., human interaction, patient and family education) in comparison to those providing care as usual [22]. Units providing PCC reduced patients length of stay by 0.25 days. Furthermore, a five-year cost-per-case analysis confirmed a cost reduction between $1600 and $3000 per case in units providing PCC compared to units with usual care [22]. Other studies revealed a strong association between PCC and reduced demand for laboratory and diagnostic tests, decreased readmission rates and fewer total inpatient days [23, 24].

As a construct, PCC is influenced by structural (hospital characteristic and work environment) and process factors (implicit rationing of nursing care) (Figure 4.1). For

instance, implicit rationing of nursing is considered errors of omission in the care processes. It is defined as "the withholding of or failure to carry out necessary nursing measures for patients due to a lack of nursing resources (staffing, skill mix, time)" [25]. Although few studies have investigated the influence of structural factors on how patients rated PCC, one from Finland reported that higher numbers of beds per unit, more units per hospital and more nursing personnel reduced patients' ratings of PCC. However, no association was found between hospital type and patients' perceptions of PCC [26]. Other studies found associations between nurse work environment factors and patient outcomes [27-29]. For example, strong leadership and adequate staffing and resource adequacy are related to increased patient satisfaction [30-32] and reductions in adverse patient outcomes [30, 32, 33]. Furthermore, inadequacies in the nurse work environment increase the potential of rationing of nursing care[34-36] lower levels of rationing of nursing care have been linked to more positive patient outcomes [37, 38]. However, no studies have investigated patients perception on PCC and the associations with the nurse work environment and rationing of nursing care. With this study, we aim (1) to describe the levels of PCC in Swiss acute care hospitals and (2) to explore the association between PCC and the nurse work environment as well as implicit rationing of nursing care.

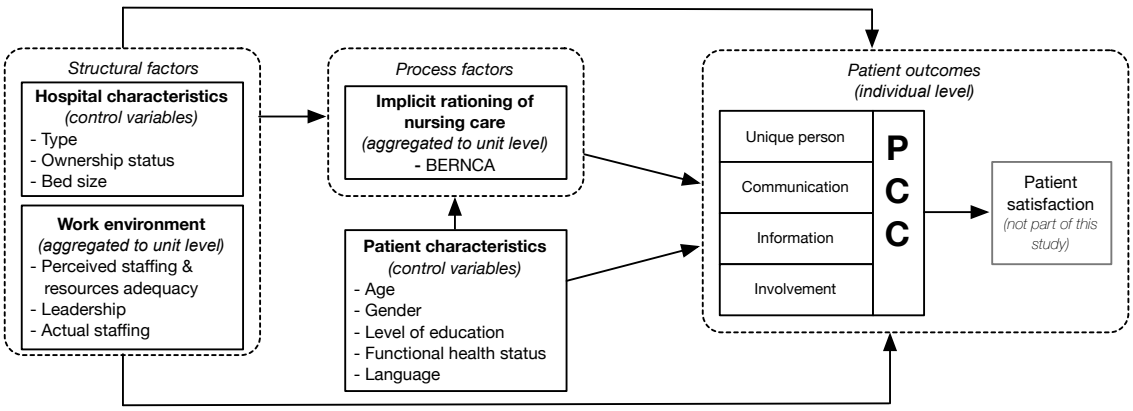

Figure 4.1: Factors influencing PCC

4.3 Methods

4.3.1 Design

This is a substudy of the "Matching Registered Nurse services with changing care demands" (Match^{RN}) study. Match^{RN} is a cross-sectional multi-center study that examines how patient safety indicators and nursing care processes and structures have changed since the introduction in 2012 of Swiss Diagnosis-Related Groups (SwissDRGs) [39]. Match^{RN} is a natural experiment using survey data before and after the introduction of the SwissDRGs, but this cross-sectional substudy only use survey data after the introduction of SwissDRGs.

4.3.2 Setting and sample

Switzerland's health care system is based on a statutory health insurance system including public mandatory but private insurance [40]. It is a high performing health care system where patients can select providers (e.g. general practitioners and specialists) almost without constrains [41].

In the Match^{RN} study, nurses and patients from 124 units of 23 hospitals from Switzerland‘s three language regions (German, French and Italian) were surveyed with self-rated questionnaires. The same hospitals and units participated in the Swiss arm of the RN4CAST study [42] in 2010 and delivered data before the introduction of DRGs. In the RN4CAST study, a quota sampling strategy was applied in Switzerland resulting in a final sample of 132 units from 35 hospitals [43]. For Match^{RN}, all of these units were invited for participation. More details about the sampling strategy and the survey methodology used in Match^{RN} are reported elsewhere [39].

This substudy contains data from the original Match^{RN} sample of 2073 patients on 123 general medical, surgical and mixed units. Patient recruitment was conducted by nurses of the respective units. Patients with ≥18 years of age, able to respond to the survey and who were hospitalized for at least 24 h were included. If necessary patients were supported filling out questionnaires by nursing staff or relatives. Furthermore, survey data included 1810 registered nurses working on those units.

4.3.3 Variables and measurement

We collected data from three sources: (1) patient questionnaires assessing PCC; (2) nurse questionnaires assessing the nurse work environment and implicit rationing of nursing care; and (3) publically available administrative documents from Switzerland‘s Federal Statistical Office cataloguing hospital characteristics (e.g., ownership status, size). For an overview of the variables influencing levels of PCC, see Figure 4.1 (above).

In addition to established scales, the patient and nurse questionnaires used self-developed items revised and adopted from those used by the Match^{RN} study team. All scales not already available in German, French and Italian were first translated into German using the World Health Organization‘s systematic translation process, consisting of forward translation and expert panel back-translation. As a second step, again including forward-backward translation, the French and Italian versions were translated based on the German version. An expert panel review consisting of clinical and research nurses with bilingual skills in the target language reviewed all questions for cultural appropriateness.

4.3.4 Outcome variable–patient experiences

We asked patients about their views on patient centeredness of care using four items corresponding to the four PCC dimensions. The items were from the Generic Short Patient Experiences Questionnaire (GS–PEQ) [44]. Using a five-point Likert scale (range: 0/“not at all” to 4/“to a very large extent”, with the additional answer option of “I do not know”) patients indicated their responses to the following questions: (1) “Did you perceive the treatment and care as adapted to your situation?” (dimension: Patient as a unique person); (2) “Did the nurses talk to you in a way that was easy to understand?” (dimension: Clinician-patient communication); (3) “Did you receive sufficient information about your diagnosis/afflictions?” (dimension: Patient information);and (4) “Were you involved in the decisions regarding your treatment and care?” (dimension: Patient involvement in care). Because the data showed no linear distribution but was skewed, we dichotomized the responses as either sufficient (to a large extent and to a very large extent) or not sufficient (to a moderate extent, to a small extent, and not at all).

4.3.5 Predictor variables: nurses work environment and implicit rationing of nursing care

Work environment: leadership, staffing and resource adequacy, and adjusted staffing
We assessed the nurse work environment using two subscales of the Practice Environment Scale–Nursing working Index (PES–NWI) [45]: (1) “Nurse manager ability, leadership,

and support of nurses" (i.e., leadership) was assessed with four items: a) whether a supervisory staff is supportive of the nurses; b) whether a nurse manager is a good manager and leader; c) whether nurses receive praise and recognition for a job well done and d) whether the nurse manager backs up the nursing staff in decision making, even if the conflict is with a physician; (2) "Staffing and resource adequacy" was assessed with four items: a) whether there was enough time to discuss patient care problems; b) whether enough registered nurses were working on each shift; and c) whether overall staff and d) support personnel were sufficient to complete all necessary tasks. All items were rated on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree) with a neutral midpoint of 2.5 [45]. For the analysis, we aggregated the data for both scales to the unit level using mean values. In the Match^{RN}–study, the Cronbach's alphas were 0.83 [95%-CI: 0.82–0.84] for the staffing and resource adequacy scale and 0.79 [95%-CI: 0.78–0.81] for the leadership scale, indicating good internal consistency for both.

Furthermore, additional to nurses' perceptions on staffing and resource adequacy (PES–NWI), we assessed a more objective measure (a standardized staffing measure). First, the nurse staffing level was calculated as the ratio between the total number of patients and the total number of registered nurses (patients-to- registered nurse ratio) in the unit during their most recent shift. Second, we used a mixed effect model and adjusted the nurse staffing level for the following variables: a) shift (morning, afternoon, or night); b) the number of patients each nurse was directly responsible for per shift (subdivided into the number of patients requiring assistance with all activities of daily living and those requiring monitoring or treatment once per hour or more than once per hour respectively); and c) skill mix as a percentage (calculated as the number of registered nurses divided number of registered nurses plus nursing care staff in total). For the analysis we used the random effects resulting from this model as standardized staffing measure.

Implicit rationing of nursing care
We used the 30-item revised version of the Basel Extent of Rationing of Nursing Care (BERNCA) instrument [25] to assess implicit rationing of nursing care over the preceding seven days, regarding, e.g., supporting activities of daily living, dressing changes, conversations with the patient and relatives, including instruction and training, and documentation. Answer options were provided on a 4-point Likert scale (range: 0/"never" to 3/"often"), with additional answer options of "activity was not necessary" or "not my assignment". Psychometric analysis yielded a Cronbach's alpha of 0.88 [95%-CI: 0.87–0.88], indicating good internal consistency. For the analysis, we summed the scores for all items and aggregated the data to the unit level using mean values.

4.3.6 Control variables: Patient characteristics and hospital characteristics

Patient characteristics
Patients were asked to assess their functional health status. To do so, we focused on the five dimensions of the EQ-5D-3L scale: mobility, selfcare, usual activities, pain/discomfort and anxiety/depression [46]. With one item representing each domain, the patient could self-rate each with 0="no problem", 1="some problems" or 2="extreme problems". In addition, we collected demographic data: gender (male/female), age (years) and level of educational (range: 0/"no school graduation" to 4/"university degree").

Hospital characteristics
We assessed four hospital characteristics, i.e., language region (German, French, Italian), hospital size (small:<100, medium: 100–300, large: 301–600, extra large:>600), ownership status (for-profit, not-for-profit, public), and the hospital type (university hospital, general hospital, district hospital).

4.4 Data collection and management

Between September 2015 and January 2016 the participating units received the paper questionnaires and decided which collection period (four weeks) suited best their organization. The patient survey data collection took place on two randomly selected working days; however, the nurses could choose any day during the four-week collection period to complete their survey. Additional details on this studys data collection and management procedures are described elsewhere [39]. The chief nursing officers of all participating units‘ hospitals provided written consent for participation in Match^{RN}. Filling out and returning patient and nurse questionnaires were considered informed consent. An external data entry service entered the data into a database, which was then checked for consistency and plausibility by the study team. Since both the patient and nurse surveys were conducted anonymously, the Match^{RN} study received exempt status from all cantonal ethical committees responsible for the participating hospitals (EKNZ UBE 15/59).

4.5 Data analysis / Statistical methods

Descriptive statistics and frequency distributions were computed for sample characteristics and all variables under study. We used a generalized linear mixed model to explore any associations between work environment, implicit rationing of nursing care and perceived level of PCC. We computed the multi-level analyses with patients on level 1 and random intercepts at the unit level (level 2). We constructed separate models for each of the four outcome variables and provided p-values and 95% confidence intervals for the non-standardized estimates. To ensure comparable results among participating hospital units, we controlled for patient characteristics (age, gender, functional status, levels of education).

We conducted sensitivity analyses to evaluate the robustness of all models. First, we tested for hospital characteristics (size, ownership status, type) with no changes in the results. Second, we calculated a three-level model with random intercepts on the hospital level (level 3). Because the main variance occurs on the unit level (level 2), the threelevel model with hospitals (level 3) showed no differences regarding associations. Third, we analyzed each model with the listwise deletion data set, which confirmed our decision to model using multiple imputation data Supplementary 1).

Missing data

Depending on the variable, between 4.4% and 11.7% of data were missing from the patient survey data Supplementary 2). Missing values are challenging the validity of data analyses [47]. To avoid the reduction of statistical power and to minimize potential bias when using listwise deletion, we applied multiple imputation by chained equations (MICE) [47] for patient survey variables (age, gender, level of education, functional health status, PCC outcome variables). In all, 1535 of 2073 patient questionnaires (74%) were complete regarding all variables of interest prior to imputation. Considering combinations of available and missing data as well as patterns and correlations between missing data within variables Supplementary 3), we specified a MICE model for the patient questionnaire. The imputation was conducted on 30 imputed data sets using R statistical software [48] Version 3.3.2 for Mac OS X using the “mice” [47] version 2.23 and “devtools” [49] version 1.12.0 packages to construct the multi-level model. Because we used the aggregated means of predictor variables from the nurse survey, missing values for these aggregate measures were dropped. Therefore, the nurse surveys contained no missing data, making data imputation unnecessary.

4.6 Results

4.6.1 Sample description

This substudy used a sample of 2073 patients. The patients mean response rate across all units was 72%, varying between 17% and 100%. Of the 2073 participating patients, 1131 were male, with a mean age of 65.5 (SD 16.62) years (range: 18–97 years). Slightly more than half (54%) were from the German speaking part of Switzerland. Table 4.1 summarizes patient characteristics including levels of education and self-rated functional health status.

The mean response rate of nurses was 78% (range: 30–100%). Altogether, 1810 registered nurses completed the questionnaire. The majority were female (88%); their mean age was 35 years (SD 10.62) and half (51%) worked in the German-speaking region. On average, the nurses had 11 years (SD 10.09) of professional experience. The 23 participating hospitals included 18 that were public; the mean number of beds was 362. Details can be found in Table 4.2. Of the 123 participating units, 62 were medical (50.4%), 54 surgical (43.9%) and 7 mixed medical/surgical (5.7%). The majority (56.9%) had 20–30 beds (n=70), followed by 28.5% with fewer than 20 beds (n=35) and 12.2% with between 31 and 40 beds (n=15). Only 2.4% (n=3) had more than 40 beds.

Table 4.1: Patient characteristics (n=2073)

		n	%	mean	SD
Language					
	German	1119	(54.0)		
	French	322	(15.5)		
	Italian	632	(30.5)		
Gender					
	Male	1132	(54.6)		
Education					
	No graduation	54	(2.6)		
	Secondary school	446	(21.5)		
	Further education/training	866	(41.8)		
	Higher education	475	(22.9)		
	University degree	232	(11.2)		
Age (years)		2073	(100)	65.53	16.62
Self-rated functional status					
	Problems with mobility	1095	(52.8)		
	Problems with self-care	769	(37.1)		
	Problems with,usual,activities	1169	(56.4)		
	Feel pain/discomfort	1399	(67.5)		
	Feel anxiety/depression	777	(37.5)		

4.6.2 Variable result description

Frequency of PCC - Outcomes data
Overall, patients‘ perceptions of PCC were positive. Eighty-nine percent of surveyed patients‘ [95% CI: 0.89–0.912] found their nurses talked to them in a way that was easy to understand; 91.2% [0.90–0.92] felt their treatment and care were adapted to their situation. Two-thirds (69.5% [0.67–0.72]) felt involved in decisions to a large extent and four-fifths (81.7% [0.80–0.83]) felt they had received sufficient information about their diagnoses/afflictions (see Table 4.3).

Summaries of PCC predictor variables
Aggregated results show that nurses rated adequate staffing and resources at the neutral midpoint (mean: 2.53) and felt strongly they were supported by leadership (mean: 3.05). Further, their mean rating for implicit rationing of nursing care was low at 0.90 (never–rarely) (Table 4.2).

Table 4.2: Hospital and predictor variable characteristics

		Valid n	%	Min.	Mean	Max.	SD
Hospital level (n=23)							
No of hospitals							
	German	15	65.2				
	French	4	17.4				
	Italian	4	17.4				
Type							
	University hospital	4	17.4				
	General hospital	16	69.6				
	District hospital	3	13.0				
Ownership status hospital							
	For-profit	3	13.0				
	Not-for-profit	2	8.7				
	Public	18	78.3				
Hospital no of beds							
	<100 beds	3	13.1				
	100-300 beds	10	43.5				
	301-600 beds	5	21.7				
	>600 beds	5	21.7				
Unit level (n=123)							
Work environment (range of answer options)							
	Staffing & resource adequacy (1–4)[a]			1.55	2.53	3.38	0.43
	Leadership (1–4)[a]			1.70	3.05	3.79	0.39
	Adjusted staffing level (standardized)[b]			-0.33	0	0.38	0.12
	Patient-nurse ratio morning				5.9		
	Patient-nurse ratio afternoon				7.3		
	Patient-nurse ratio night				14.2		
	Skill Mix in %			35.6	59.6	96.4	0.09
Implicit rationing of nursing care							
	BERNCA (0=never, 1=rarely, 2=sometimes, 3=often)			0.31	0.90	1.68	0.03

Min. = Minimum; Max. = Maximum; SD = Standard Deviation

[a] 1 = strongly disagree; 2 = somewhat disagree; 3 = somewhat agree, 4 = strongly agree

[b] standardized by intercepts

Table 4.3: Frequency of perceived patient centered care

	Not at all n (%)	To a small extent n (%)	To a moderate extent n (%)	To a large extent n (%)	To a very large extent n (%)	Not available n (%)
Easy to understand	13 (0.7)	32 (1.6)	148 (7.5)	851 (43.0)	937 (47.3)	92 (4.4)
Sufficient information	34 (1.7)	72 (3.7)	251 (12.9)	722 (37.1)	869 (44.6)	125 (6.0)
Treatment & care adapted	15 (0.8)	33 (1.7)	123 (6.3)	761 (38.9)	1022 (52.3)	119 (5.7)
Involved in decisions	86 (4.7)	146 (8.0)	326 (17.8)	695 (38.0)	577 (31.5)	243 (11.7)

Table 4.4: Factors related to PCC

	Easy to understand		**Sufficient information**		**Involved in decisions**		**Treatment & care adaped**	
	Beta (CI)	SE	Beta (CI)	SE	Beta (CI)	SE	Beta (CI)	SE
Work environment								
Staffing & resource adequacy	0.486 * (0.06 – 0.91)	0.215	0.638*** (0.30 – 0.98)	0.175	0.351* (0.03 – 0.67)	0.162	0.456* (0.04 – 0.87)	0.211
Leadership	0.405 (-0.04 – 0.85)	0.227	0.403* (0.03 – 0.77)	0.188	0.303 (-0.03 – 0.64)	0.169	0.462* (0.04 – 0.88)	0.215
Adjusted staffing	-0.301 (-1.83 – 1.23)	0.780	-0.910 (-2.13 – 0.31)	0.624	-0.127 (-1.22 – 0.97)	0.558	-1.256 (-2.68 – 0.17)	0.725
Implicit rationing of nursing care	-0.781* (-1.41 – -0.15)	0.321	-0.764** (-1.27 – -0.26)	0.259	-0.451 (-0.91 – 0.01)	0.234	-0.912** (-1.50 – -0.33)	0.299

CI = 95%-Confidence interval

All models controlled for patient characteristics (age, gender, language, levels of education)

*p<.05; **p<.01; ***p<.001

Factors related to PCC
Implicit rationing of nursing care and two of the three work environment factors were associated with PCC (Table 4.4). High nurse ratings regarding staffing and resource adequacy were strongly associated with higher patient ratings across all PCC dimensions. The units with highest staffing and resource adequacy ratings had 15% more patients with favorable 'received sufficient information' ratings compared to the units with the lowest staffing and resource ratings.

Higher levels of nurses ratings of support from leadership also increased the probability that patients reported that they had received sufficient information. Finally, compared to the units with the lowest leadership support ratings by nurses, in the units with the highest ratings, 9.5% more patients felt their treatment and care had been adapted to their situation. However, adjusted staffing was not associated with any of the PCC dimensions. Furthermore, lower nurse ratings for implicit rationing of nursing care correlated with higher patient ratings for three PCC dimensions: easy to understand, sufficient information and treatment and care adapted. These results are similar to results using listwise deletion method. With multiple imputation, the standard error was slightly smaller across all models (about 3.3%, see Supplementary 1).

4.7 Discussion

This study provides new insights into the provision of PCC in acute care hospitals and its association with structural and process factors. The Swiss healthcare system provides high quality of care in at least two ways. First, in general, compared with their counterparts in other European countries, nurses in Swiss hospitals have to care for fewer patients per shift [28]. Second, alongside this high nurse-to-patient-ratio, studies on patient experiences with care in Swiss hospitals show positive evaluations [28, 41, 50, 51].

In line with previous national and international studies, our study results support the findings of high quality nurse work environments in Swiss hospitals [28, 52] and low levels of implicit rationing of nursing care [36, 53]. However, there is room for improvement. For example, we found that more than a third of participating patients did not feel sufficiently involved in their own treatment and care decisions. This result is in line with findings from a Swedish survey where 39% of patients reported that they would have preferred more involvement in nursing care decisions than experienced [54]. Patient involvement in treatment and care decisions is a key element of PCC [6, 11, 55] and is associated with other indicators of quality of care. For example, a 2015 systematic review noted that, while many of the reviewed studies reported improvements in affective-cognitive outcomes, e.g., increased patient satisfaction and reduced concern/anxiety about illness [56], most of the studies measured the association of shared decision making and patient outcomes cross-sectionally, with few patient-clinician interactions. Even where opportunities for patient involvement arise, fruitful participation in decision making is rooted in sufficient information, which relies on adequate communication [57, 58]. Nearly 20% of the surveyed patients did not feel sufficiently informed about their diagnoses/conditions. Of all health professionals, nurses spend the most time with patients [58, 59]. This gives nurses the responsibility and opportunity to provide patients with necessary information in order they can be part of the decisions about the nursing care provided.

Nurse reported staffing and resource adequacy and PCC are strongly associated. However, depending on the staffing measure, we found major differences in the results. All four PCC dimensions showed moderate to strong associations with perceived staffing and resource adequacy, whereas adjusted staffing (the adjusted patient to registered nurse ratio) was not associated with any PCC dimension. Previous research has established that nurses' perceptions of staffing and resources rely on more factors than simply the number

and skill mix of personnel [60, 61]. In contrast to adjusted staffing, perceived staffing on each respondent‘s subjective assessment of whether both human and time resources are sufficient to provide high quality care. Human resources involve not only whether the nurse is a registered nurse but also the nurses‘ education, experiences, and perhaps willingness to work together in a team. Nurses evaluate the entire range of care staff and support services (i.e transport services, unit administration and secretarial support) that enable nurses to care for their patients. Our analyses link nurses‘ perceptions of staffing and resource adequacy with patients‘ ratings of PCC. Although extensive research has explored the association between staffing and patient satisfaction [28, 29, 62], these findings show the importance of nurses‘ perception of the same factors in a hospital that sets out to implement PCC.

Additionally, to provide a healthy work environment, supportive leadership is crucial [63] which increases nurses‘ engagement and performance [32]. Leadership is positively linked both to nurses‘ motivation to perform and to patient care outcomes, i.e, increased patient satisfaction [28, 29, 62] and reduced restraint use [32]. Furthermore, effective nurse leadership is a building block for healthcare changes [64] such as creating a culture with processes that supports PCC. Our study adds to these previous findings by showing the correlation between effective leadership and patient perceptions of two essential PCC components: the adequacy of the information provided to patients and the adaptation of treatment and care to suit their needs.

Not surprisingly, perceived adequate staffing levels effects quality of care by reducing the levels of implicit rationing of nursing care [36]. Furthermore, previous studies noted not only that patients quickly recognized when nursing care was missed [65, 66], but that even minor omissions diminished patients‘ overall opinions of the care they received [65, 66]. Conversely, minimizing implicit rationing of nursing care/missed care leads to increased patient satisfaction [29, 38, 53, 67]. Our study adds to the international evidence regarding patient experiences and shows the negative association between implicit rationing of nursing care and PCC. The lower the level of implicit rationing of nursing care, the better patients understood their nurses, felt sufficiently informed and recognized that they were receiving highly individualized treatment.

4.7.1 Strengths and limitations

This study has several notable strengths. To our knowledge it is the first study in a national sample of acute care hospitals to evaluate patient perceptions of PCC and their relations with the nurse work environment and implicit rationing of nursing care. Moreover, the patient and nurse surveys had large sample sizes and high response rates. However, our study also has several limitations. First, it is an observational study design using cross-sectional survey methodology and allows no conclusions regarding causality. Second, our findings are only generalizable for the Swiss acute care setting. Third, while the sample consists of 20% of all acute care hospitals in Switzerland, participation was voluntary, potentially leading to selection bias. Fourth, we used only two of the five nurse work environment subscales, because the primary study included only these two. Using all 5 subscales and the composite scores may have produced other results. Fifth, the patient surveys had an overall data omission rate of 26% across all variables, which required multiple imputation and consideration of inter-variable dependencies. We minimized biases by conserving the sample size, which also increases the statistical power. Although the differences between findings using multiple imputation and listwise deletion were quite small, the analyses of missing data and the underlying missing mechanisms are essential to identify potential bias and therefore false inferences [47, 68]. Sixth, some patients were supported by nursing staff when answering the questionnaire, which might have influenced some of the responses therefore introducing bias. Finally, as in other patient experience studies, we encountered ceiling effects and limited variation between provider ratings [51],

raising the question of how a sufficient and sensitive patient experience measure should look like. Nevertheless, despite its limitations, our study highlights the importance of PCC implementation in Swiss acute care hospitals, and its association with nurses‘ work environment factors on the provision of PCC. Clinicians and managers can use these findings to start or improve PCC.

4.8 Conclusion

This is the first study to examine the complex associations between the nurse work environment, implicit rationing of nursing care, and PCC in the setting of Swiss acute care hospitals. Even though patients reported high PCC levels, the need for optimization is evident regarding patient involvement in decisions of care and treatment. Nursing care is central to PCC provision. Involving patients in decisions requires that everyone ‘lives a PCC culture’, which is one where patients both receive enough knowledge and are part of the decisions regarding their care and treatment [69]. In this coproduction healthcare model, involved professionals need to evaluate each patients values and needs in terms not only of usual care but also of the PCC dimensions of involvement and information.

Despite the slight variations between the participating Swiss hospitals, we were able to identify work environment factors associated with PCC. For a successful shift from paternalistic healthcare to PCC, hospital managers need to ensure that every employee with patient contact is trained in patient-centered communication. Prerequisite for this shift towards PCC is of course allowing time to do so in the daily provision of care. Therefore, beside training employees in how to provide patient-centered care, hospital managers need to develop nurse work environments which enable nurses the time for example to provide patient-centered communication. Clinicians will need to reflect on their communication with patients, i.e., if the information each patient receives is adequate and understandable. Furthermore, to optimize the patient-professional partnership, a minimum set of general conditions must be put in place, including an adequate work environment, continuing training and education, and interprofessional teamwork. At the levels of the CEO, department and unit, leadership training must be provided to develop competent and supportive leaders who will enable and promote a healthy work environment [32, 70]. This work environment should include explicit, high-priority attention to nurses perceptions of staffing and resource needs. The overall target is that well-led, engaged staff will accept, embrace, and live a PCC culture. Future needs for PCC research will include the identification and development of instruments to distinguish meaningfully between hospitals providing PCC, as well as to assess the relative values of various PCC component mixes in specific contexts.

4.9 Funding

The study was funded by the participating hospitals.

4.10 Conflict of interests

No conflict of interest has been declared by the authors.

4.11 Ethical approval

The study was proved from all ethics committees responsible for the 23 participating hospitals and received exempt status approval. Because the study is observational and

surveys were conducted anonymously, it does not require ethical approval according to Swiss Federal Law.

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Chapter 5

Insufficient variance between providers with patient experience surveys: methodological considerations and findings from a Swiss multicenter study

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5.1 Abstract

Background. Provider profiling is measuring performance (e.g., of hospitals and units) with quality indicators to compare and categorize providers regarding their health care quality. It is used as policy instrument and steering mechanism for care quality improvement. However, measurement is influenced by uncertainty, e.g., high levels of random variation (intra-class correlation 1 = ICC1) and measurement error (due to noise, intra-class correlation 2 = ICC2). One purpose of provider profiling methods is to filter out data that obscure the 'true' variability between providers. In this paper, we discuss the need for ICCs as the prerequisites for provider profiling. We also describe ICC computation and its application to evaluate quality indicators.

Methods. To apply provider profiling, we used patient survey data from a cross-sectional multi-center study of 23 Swiss hospitals with 123 units. The patient experience survey includes various questions regarding the hospital stay drawn from the Hospital Consumer Assessment of Healthcare Providers and Systems survey and the Generic Short Patient Experiences Questionnaire. To explore variations between providers and reliability of the profiling methods, we used mixed effects models to calculate ICC1 and ICC2 at the unit and hospital levels. Additionally, for the calculation of the ICC1, we used further analytical tools (e.g., plots, permutation tests, a 95% Confidence Interval of ICC1) to evaluate the variances.

Results. Depending on the item measured, 1716–1863 patients completed questionnaires. The ICC1 values ranged from 0.013 to 0.059 (mean: 0.031) at the unit level, and from 0.009 to 0.035 (mean 0.023) at the hospital level, indicating no to small between-provider variability. ICC2 values ranged from 0.62 to 0.885 (mean 0.691) at the unit level, and from 0.176 to 0.454 (mean 0.345) at the hospital level, indicating moderate to good unit level reliability, and no to fair hospital level reliability. However, further analytical approaches ,e.g., plotted results, showed no to very small variance between providers.

Conclusions. In our example, few items reached satisfactory ICCs. However, further analytical approaches revealed no notable between-provider differences for any item. Provider profiling demands the capacity first to confirm that sufficient variance exists for reliable measurement, then to assess variance accurately enough to identify positive or negative deviations. The entire process requires all analytical approaches, including calculated and visualized results, to be assessed and interoperated to examine items ability for provider profiling. Additionally, our analyses indicated that ranking providers reliably enough would require stronger between provider variance of patient experience items than our sample provided. The use of patient experience as quality indicators is not advisable without sufficient ICCs. We could recommend none of the examined items for use in provider profiling.

5.2 Introduction

Provider profiling is a performance measure used as a policy instrument and steering mechanism to improve the quality of health care across similar institutional settings [1-3]. For stakeholder groups such as health care policy makers, this helps gauge the efficiency of hospital structures and processes in relation to quality of care [4]. For patients, provider profiling offers relevant information regarding hospitals services, allowing them to compare hospitals for the purpose of selecting a provider.

Profiling can be applied at three levels. The first is the individual, i.e., for comparison between persons, e.g., clinicians [5]. The second level is the unit or ward level, comprised of groups of individuals formed according to particular functional areas, e.g., surgical versus medical [6]. The third level refers to entire institutions, e.g., hospitals [7, 8]. Because sample sizes influence the reliability of provider profiling results [9], group level profiling (e.g., hospital units) is popular [10]. Beyond that, in the U.S., for example, hospital-level profiling results are commonly used to decide on distributions of funds from payment programs [11]. Therefore, given the significant impact of provider profiling on policy, practice and funding, an effective, valid and reliable approach that considers methodological challenges is necessary.

The purpose of provider profiling is often to compare between providers via quality indicators such as patient safety indicators, e.g., adverse events, or patient experiences with their hospital stay, assessed via questionnaire surveys. Based on these data, providers can be categorized as positive or negative deviants, i.e., high- (positive) or low- (negative) performing providers. For instance, benchmarking can identify positive deviants, which can be used to provide and foster opportunities for lower-ranked hospitals to improve [12, 13]. However, for 'positive deviant' systems to work, measures have to have not only enough sensitivity to reliably identify high-performing units or institutions, but also enough specificity to identify low-performing ones. The problem that arises here is that comparison is only useful where the relevant differences are visible and measurable. With no quantifiable differences between providers, no stimulus exists for quality improvement of hospitals, making the value and applicability of the measure questionable. In the best case, no variation indicates a consistent level of care quality across institutions; in the worst, it indicates that the measure is not sensitive enough to differentiate meaningfully between variations in quality of care.

While both the validity and reliability of questionnaire instruments are often well established, then, what is often not established is those instruments', their scales' or single items' capacity to detect relevant differences between providers being profiled. In Switzerland, for example, national patient experience measurements appear to have plateaued at very high levels, with few differences evident in provider performance [14]. Rather than indicating consistently high quality, though, the available values may simply reflect the principle that rewarding positive measurements and penalizing negative ones discourages accurate reporting. Given the clear conflict of interest this creates, the results have little credibility as a steering mechanism. However, that possibility is beyond the scope of this study.

Even with high sensitivity and specificity (minimizing the chances of Type I and II errors), reliable results demand sufficient between-provider variance to distinguish them from 'noise'– also referred to as statistical uncertainty, chance or random variation. Also, even where accurate measurements can be assured, very low levels of between-provider variability can result in inaccurate ranking and classification [3, 16].

Determining the degree of variance between providers beyond chance is one major function of intra-class correlations 1 and 2 (ICC1 and ICC2) [15]. By accounting for the noise, the ICC1 helps clarify variance between providers. Adjusting for that noise, the intra-class correlation 2 (ICC2) – also known as the signal-to-noise-ratio – indicates the measurement's reliability and the degree to which it is influenced by measurement errors.

Therefore, to achieve a truer depiction of the variability between hospitals, provider profiling should employ ICC1 and ICC2 calculations. Here too, though, low variation levels can result in the misclassification of providers [17]. I.e., where quality measurement instruments lack the capacity to identify the degree of variance between providers – especially where measurement errors and biases are likely – provider profiling is unreliable.

To improve health care patient experience assessment is a useful tool [21-24]. Regardless of the cluster level, patient experience data have become a common basis for provider profiling [18-20]. Several methods of comparing providers based on patient experiences ensure more or less robust assessments of "true" variability, with minimal noise effects.

The most common compensatory approach is the risk adjustment method, which allows the researcher or statistician to account for confounding variables (e.g., hospital and patient characteristics) that can influence provider profiling results [25-27]. For example, the fact that university hospitals are often larger and care for more severely ill patients than general or district hospitals [28] can influence not only clinical outcomes, e.g., mortality rates [29], but also patient reported outcomes, e.g., satisfaction with hospital stay [30]. Applying the risk adjustment method for patient (e.g., gender, age, health status) and hospital (e.g., size, teaching status) characteristics, minimizes measurement errors due to differences in hospital and patient characteristics. Using crude (unadjusted) data, university hospitals would very likely receive lower ratings based not on the quality of their care, but on their patient populations [31].

Internationally, diverse patient experience measures match the approaches, settings and target populations of the areas where they are used. In the U.S., possibly the most popular survey instrument assessing patient experiences with hospital care is the "Hospital Consumer Assessment of Healthcare Providers and Systems" (HCAHPS) [32]; in the U.K. the National Health Service (NHS) Adult Inpatient Survey [33] is widely popular. The latter was developed based on the Picker Patient Experience Questionnaire (PPE-15) [34-36]. In Switzerland, patient experience surveys mostly contain questions from the HCAHPS and PPE-15 [37-40]. Notwithstanding the three surveys' differences regarding their conceptual frameworks and numbers of questions, all three assess patient experiences regarding hospital care with a focus on (i) communication, (ii) information, (iii) education and involvement, (vi) pain management, and (v) courteous and respectful treatment.

Unfortunately, however, studies that use these questionnaires for provider profiling do not typically provide complete information regarding between and within-provider variances. In fact, to our knowledge, no articles, either national or international, using either the HCAHPS or the NHS survey, have reported either variance between and within providers (ICC1) or the degree of the resulting profiles' reliability (ICC2). For the PPE-15 survey, one study examined the ICC1, but without sufficient variation between clusters (e.g., units or hospitals) [41]. Another assessed patient hospital stay experiences using the PPE-15 and benchmarking in a sample of Swiss hospitals [31]. In that case, although the researchers reported the variance among patient responses explainable by patient characteristics, they did not assess the PPE-15 items' between-hospital variance and therefore did not confirm whether those items were appropriate for profiling purposes. Also, in studies of the HCAHPS and NHS surveys, authors reported ceiling effects and skewed profiling results [42]. In Switzerland a Swiss Academy of Medical Sciences (SAMS) checklist offers recommendations for publication of medical outcome data such as patient experiences [43]. It also recommends the assessment of validity and reliability, and the application of risk adjustment for patient characteristics, as well as detailed explanations of the benchmarking process. However, it does not recommend calculation of ICC1 and ICC2 values for profiling outcomes.

Patient experience surveys are commonly used both for quality monitoring and for provider profiling. However, high ceiling effects are consistently reported, leading to

low between-provider variability. Additionally, researchers often employ overly simple statistical approaches to analyze these patient-reported outcomes, then limit their results further via their use of underdeveloped methodological considerations.

In this paper, we discuss the need to calculate and assess ICC1 and ICC2 as prerequisites for provider profiling based on patient experience survey data. Specifically, we pursued three main goals: 1) to describe the calculation of the two types of the intra-class correlation (ICC1 and 2) for assessment of inter-provider variability and reliability; 2) to calculate both intra-class correlation types in an empirical example of patient experience data from a national sample of Swiss acute care hospitals and 3) to evaluate the appropriateness of several items in an empirical example.

5.3 Materials and methods

As the starting point of a robust approach for provider profiling, we first calculate the ICC1 and the ICC2 to describe the uncertainty of the measurements.

5.3.1 Intra-class correlation 1 (variance)

The ICC1, also known as the variance partitioning coefficient, describes provider variability, accounting for differences occurring due to random variation [15]. The ICC1 ranges from 0–1, whereby the lower the value, the higher the chance that the observed differences are influenced by random variation. In U.S. data from army trainers and school teachers, ICC1 values typically range from 0.05 to 0.20 [44], whereas in ecology and evolution, values above 0.20 are more common [45]. In health services research, in the few cases where ICC1 values are reported, values above 0.2 are rare. For some authors the ICC1 is conceptualized as the extent to which membership in an organization (e.g., a hospital) accounts for the variance of any given outcome variable reported by that organizations members. For values below 0.05 we would conclude that the variation between providers is too small to be meaningful and to identify the differences producing this coefficient as random. In this case, a comparison between providers would not be recommended, as it could not produce reliable results. On the other hand, values above 0.05 would indicate sufficient between-provider variation to differentiate between positive and negative deviants.

The Intraclass correlation 1 is determined by

$$ICC = \frac{between\ provider\ variance}{between\ provider\ variance + within\ provider\ variance} = \frac{\sigma_u^2}{\sigma_u^2 \quad + \quad \sigma_e^2},$$

where σ_u^2 is the between provider variance and σ_e^2 is the within provider variance [49].

Variance estimates are usually derived from random intercept models in a mixed model framework. The σ_u^2 and σ_e^2 can be estimated directly from a linear mixed model. In a generalized linear mixed model, e.g., for logistic or Poisson distributed outcome variables the (σ_e^2) must be approximated most often by $pi^2/3$ [46].

5.3.2 Intra-class correlation 2 (reliability)

The ICC2, which also ranges from 0–1, determines the level of measurement error. With 1 signifying perfect reliability [47] and values $\geq$0.8 are desirable [48]. Lower levels make detection of between-provider differences more difficult [17]. To achieve adequate ICC2 values (high reliability), sufficient between-provider variances (adequate ICC1 values) are necessary [49]. In this way the ICC2 is closely linked to the ICC1, as both rely on the

between- and within-provider variances. However, because the number of providers of the sample influences the reliability, the ICC2 also considers the number of clusters (k) (e.g., the number of hospitals). The ICC2 [49] is accordingly

$$ICC2 = \frac{between\ provider\ variance}{between\ provider\ variance + (within\ provider\ variance/n)} = \frac{\sigma_u^2}{\sigma_u^2 + \sigma_e^2/k}\ ,$$

where σ_e^2 the between-provider variance, σ_e^2 the within -provider variance and k the sample size on the cluster level.

5.3.3 Risk adjustment

In addition to measures of between-provider variability (ICC1) and reliability (ICC2), profiling should include a risk adjustment process. As noted above, differences between patient and hospital characteristics can disadvantage certain providers, as differences in performance scores might be driven partially by differences in patient characteristics rather than performance. The effects of patient characteristics are well documented, e.g., a systematic review of empirical HCAHPS studies found that older patients and those with poorer health status tended to report lower levels of satisfaction [27]. The capacity to identify and correct for such factors makes risk assessment particularly useful in provider profiling. However, which patient characteristics influence ratings in which way is not consistently reported. For example, contradicting Mazurenko et al., Bruyneel et al. observed that younger age influenced patient rating negatively [50]. Still, HCAHPS measures are adjusted for specific patient characteristics, e.g., age, education and language [32]. Also, in NHS trusts in England, patient reports of their experiences with hospital care are influenced by characteristics such as patient age, gender and self-rated health status [36].

Further, rural hospitals outside of London were rated more positively than London hospitals [36]. Alongside regional characteristics, profit status influences patients perceptions. For example, a study in Germany found that patients considered not-for-profit hospitals more trustful and warm but less competent than for-profit ones [52]. Findings of earlier U.S. studies support the influence of ownership status on patient ratings: there, patients give lower ratings to teaching hospitals [53], large institutions [27, 53], and those that include intensive care units [53]. Because of the often unexpected influences patient and hospital characteristics exert on provider rankings, risk assessment adds a level of consistency not available via other means.

5.3.4 Material

5.3.5 Design

This sub-study used patient survey data from the cross-sectional multicenter *Matching Registered Nurse Services with Changing Care Demands* (Match^{RN}) study. That study‘s overall aim was to examine how patient safety indicators and nursing care processes and structures have changed since the 2012 introduction of Swiss Diagnosis-Related Groups. More details of the Match^{RN} study have been published elsewhere [54].

5.3.6 Data source and study population

For the application of provider profiling methods in our empirical Match^{RN} example, we used patient survey data from 123 units of 23 acute care hospitals from the German, French and Italian language regions of Switzerland. To be included in Match^{RN}, patients had to be at least 18 years old, hospitalized for at least 24 h and able to respond to the survey [54].

5.3.7 Outcome variables for provider profiling

Based on the Match^{RN} patient survey, we assessed various questions regarding patients‘ perceptions of their hospital stays. We used the HCAHPS survey and the Generic Short Patient Experiences Questionnaire (GS-PEQ) [55] because they were included in the primary Match^{RN} study [56]. For this analysis, we focused on four GS-PEQ items: (a) *Did the nurses talk to you in a way that was easy to understand?* (dimension: communication); (b) *Did you receive sufficient information about your diagnosis/afflictions?* (dimension: information); (c) *Did you perceive the treatment and care as adapted to your situation?* (dimension: respectful treatment),; and (d) *Were you involved in the decisions regarding your treatment and care?* (dimension: involvement). The responses were marked on a 5-point Likert-type scale ranging from “not at all” to “to a very large extent”. As the responses were only 5-point scaled and heavily skewed, we dichotomized the responses as positive (to a large extent and to a very large extent, 1) or negative (to a moderate extent, to a small extent, and not at all, 0). The additionally answer option ”I do not know” was coded as missing. More information about the GS-PEQ items can be found elsewhere [54].

In addition to the items from the GS-PEQ, we included several from the HCAHPS questionnaire: (e) *During this hospital stay, how often did nurses listen carefully to you?* (dimension: communication); (f) *During this hospital stay, how often did nurses explain things in a way you could understand?* (dimension: communication); (g) *During this hospital stay, how often did nurses treat you with courtesy and respect?* (dimension: respectful treatment). Answers were marked on a 4-point Likert-type scale ranging from “always” to “never”. We also dichotomized these answer options – this time into “always” (1) versus “usually”, “sometimes” and “never” (0). Additionally, we included two further questions from the HCAHPS providing a global hospital stay rating (h) *Using any number from 0 to 10, where 0 is the worst hospital possible and 10 is the best hospital possible, what number would you use to rate this hospital during your stay?* (response options: 0 to 10); and (i) *Would you recommend this hospital to family and friends?* (respond options: “definitely no”; “probably no”; “probably yes”; and “definitely yes”). As is common practice in analyzing these items, we dichotomized item (h) into 0 (0-8) and 1 (9 and 10) and item (i) into 0 (definitely no, probably no, and probably yes) and 1 (definitely yes) [7, 8, 57-59].

5.3.8 Control variables for risk adjustment

Patient characteristics

Along with patient questionnaire data, we examined patient demographics, i.e., age (years), gender (male/female), education level (range: 0 (“no school graduation”) to 4 (“university degree”)) and health status using the EQ-5D-3L scale [60]. Patients could self-rate the five dimensions of the EQ-5D-3L (“mobility”, “self-care”, “usual activities”, “pain/discomfort” and “anxiety/depression”) with three answer options: “no problem”, “some problems”, or “extreme problems”. For analysis, we calculated a sum score for the five dimensions (“no problems” = 0; “some problems” = 0.5, “extreme problems” = 1) with a minimum possible sum score of 0 (no problems in any of the five dimension) and a maximum of 5 (extreme problems in each of the five dimensions).

Hospital characteristics

Using public data provided by Switzerlands Federal Statistical Office, we included hospital characteristics such as size (small:<100, medium: 100–300, large: 301–600, extra large: >600, ownership status (private, non-profit, public), and type (university hospital, general hospital, district hospital). Furthermore, we calculated all patient response rates at the unit and hospital level.

5.3.9 Ethical Considerations

The Match^{RN} study was exempted from ethical review by all Swiss cantonal ethical committees responsible for the participating hospitals (EKNZ UBE 15/59). The patient surveys were conducted anonymously; completing and returning the form were considered informed consent.

5.3.10 Analyses

Due to missing data, sample sizes varied depending on the outcome variable. At the unit and hospital levels, we calculated the ICC1 to assess variance between providers and the ICC2 to assess reliability for the nine patient experience items, i.e., the four GS-PEQ and five HCAHPS items. Applying a two-level model for each ICC, we constructed 72 models (36 models for the ICC1 and ICC2, i.e., two for each of the nine outcome variables at the hospital level, and two more at the unit level, using adjusted and unadjusted models) using R statistical software [61], Version 3.3.2 for Mac OS X using the "rptR" package version 0.9.2. [45].

As recommended, we used mixed effects models, applying the log-link function for binominal data and using the models link scale to determine ICC1 and ICC2 [46]. We also calculated risk-adjusted ICC1, as well as ICC2 estimates including risk adjustments for the four selected patient characteristics (age, sex, education, self-rated health status) and three hospital characteristics (size, type, ownership status). Following the methodology from economics and evolution research [45], we further evaluated the analytical approaches. To test whether the ICC1 was zero, we used the permutation test with 1000 permutations as suggested by Stoffel et al. (2017). Where permutations are $p<.05$, estimates are considered to be above zero. To describe the uncertainty of the estimates we also provide 95% confidence intervals (CI). Because, as shown above, the ICC2 is basically the ICC1 incorporating k, we did not provide the permutation test results for the ICC2, as they would not differ from those for the ICC1.

Additionally, to evaluate the ICCs fully, we produced histograms of all ICC1 estimates with their 95% -CIs and caterpillar plots of empirical Bayes of the same models. These plots were useful for the ICC calculations, as they allowed us both to visualize the uncertainty of the estimates and to show how calculated results effected hospital benchmarking by reliably identifying positive or negative deviants.

5.4 Results

5.4.1 Sample describtion

Due to missing data and depending on the variable, we included between 1716 and 1859 questionnaires from 2073 patients in our analyses (see Table 5.1). The overall response rate was 72% (range: 17% and 100% per unit). The number of completed questionnaires per hospital varied from 14 to 215 and per unit from 4 to 39. The majority of participants were male (55%); mean age was 65 years. Table 5.1 summarizes patient characteristics including levels of education and self-rated functional health status sum score.

5.4.2 Variance and reliability for unadjusted and adjusted models

To assess the ICCs of the nine outcome variables we calculated both ICC1 and ICC2 on both levels (unit and hospital level) for both models (unadjusted and adjusted). On the unit level, three (variables a, b, f) of the nine outcomes fulfilled the threshold criterion of ICC1 $\geq$0.05; however, for adjusted models, no items fulfilled this criterion Table 5.2. On the hospital level, neither adjusted nor unadjusted models produced ICC1 values $\geq$0.05.

Table 5.1: Study sample patient characteristics

		%	min.	mean	max.	SD
Gender						
	male	55				
Education						
	No graduation	2.5				
	Secondary school	21.4				
	Further education/training	42.0				
	Higher education	22.9				
	University degree	11.3				
Age (years)			18	65	97	16.49
Sum score	self-rated functional status*		0	1.35	5	1.07

Min.=Minimum; Max.=Maximum; SD=Standard Deviation

* 0 = no problems in any of the 5 dimensions; 5 = extreme problems in every of the 5 dimensions; graduation in 0.5 steps

For ICC2 values, a similar pattern was observed. All ICC2 values were lower for the adjusted than the unadjusted models. At the unit cluster level, five (a, b, d, e, f) of the nine items met the threshold for reliability, i.e., ICC2 $\geq$0.8. Of the adjusted models, only variable b met the reliability criterion. On the hospital cluster level, no items, using either adjusted or unadjusted models, met the threshold. All ICC1 and ICC2 estimates for all outcome variables can be found in Table 5.2.

Visualization of ICC1 values (excerpt)(All plots can be found in the supplementary materials)

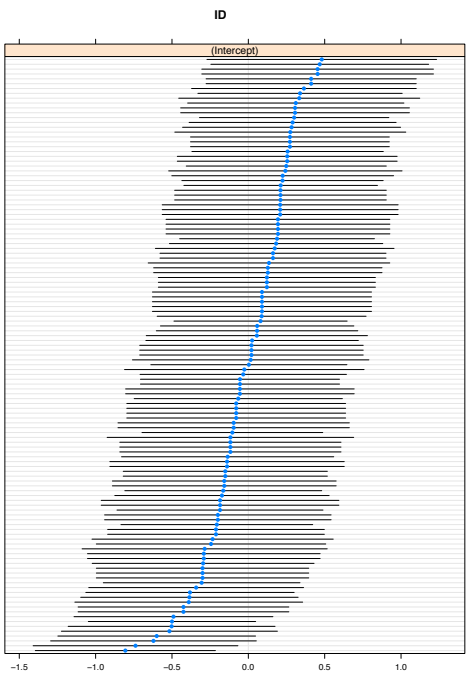

Figure 5.1: caterpillar plot: variable f: "During this hospital stay, how often did nurses listen carefully to you?" (unadjusted unit level)

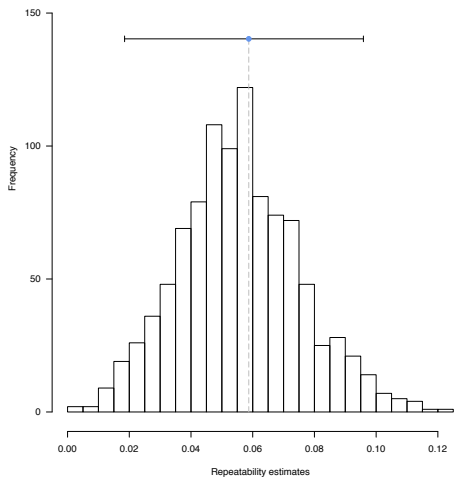

Figure 5.2: histogram variable f: "During this hospital stay, how often did nurses listen carefully to you?" (unadjusted unit level)

To evaluate the appropriateness of the outcome variables (aim 3), we used calculated and visualized analytical approaches. Of all outcome variables, item f – "During this hospital stay, how often did nurses listen carefully to you?" – shows the most satisfying result across all analytical approaches. First, variable f has the highest calculated ICC1

(0.059), indicating sufficient between-provider variance. Second, the permutation test (using a threshold of p<.01) supports the results of the calculated ICC1, i.e., ICC1 $\neq$ 0. Third, the caterpillar plot Figure 5.1 shows the most differences between units (2 of 123 units). The y-axis shows the number of units, i.e., 123. Each line shown on the caterpillar plots represents a hospital unit (n=123); the start and end of each line delineate the 95%-CI, with the blue dot representing the point estimate (intercept). The x-axis shows the range of estimates, and the light grey vertical line represents the grand mean (standardized at 0), which is the mean of all unit estimates. True variability between units is present when their whiskers do not touch the grand mean or their whiskers do not overlap. For variable f, this is the case for two units (the lower one 122 and 123). Fourth, the histogram distribution pattern verifies the trustworthiness of the 95%-CIs Figure 5.2. The histogram describes the uncertainty of the estimated ICC1s based on permutations, with the y-axis showing the number of cases a certain estimate (x-axis) was calculated). The histogram for variable f display a tight 95%-CI, which is in line with the calculated 95%-CI (0.018–0.096). Alongside the consistency between calculated and visualized 95%-CIs, neither the calculated nor the visualized 95%-CI includes 0. A 95%-CI including 0 indicates that the estimate is not significantly different from 0. Fifth, the histogram followed an unskewed bell-shaped distribution. The visualized values are based on calculated values and quantify and illustrate the calculated values. For the other models, no variables yielded a similar combination of sufficient ICC1 values, tight CIs, bell distributions or other desirable analytical results (see supplementary materials).

Table 5.2: ICC1 and ICC2 for unadjusted and adjusted models on unit and hospital level

Source	Item	n	ICC1 [95%-CI]				ICC2 [95%-CI]			
			unadjusted		adjusted		unadjusted		adjusted	
			unit level	*hospital level*	*unit level*	*hospital level*	*unit level*	*hospital level*	*unit level*	*hospital level*
GS-PEQ	(a) Did the nurses talk to you in a way that was easy to understand?	1859	0.051* [0-0.113]	0.023* [0-0.059]	0.018	0	0.868 [0-0.943]	0.353 [0-0.596]	0.69	0
	(b) Did you receive sufficient information about your diagnosis/ afflictions?	1826	0.054** [0.011-0.092]	0.025** [0-0.053]	0.035** [0-0.069]	0.006* [0-0.014]	0.876 [0.566-0.930]	0.368 [0-0.598]	0.817 [0-0.895]	0.113 [0-0.241]
	(c) Did you perceive the treatment and care as adapted to your situation?	1828	0.013	0.021	0	0	0.62	0.334 [0-0.602]	0	0
	(d) Were you involved in the decisions regarding your treatment and care?	1716	0.047*** [0.01-0.082]	0.035*** [0.005-0.066]	0.016* [0-0.038]	0.007* [0-0.014]	0.859 [0.548-0.921]	0.454 [0.1-0.642]	0.666 [0-0.824]	0.142 [0-0.221]
HCAHPS	(e) During this hospital stay, how often did nurses treat you with courtesy and respect?	1863	0.044* [0-0.089]	0.021** [0-0.05]	0.017 [0-0.048]	0 [0-0.005]	0.85 [0-0.926]	0.329 [0-0.541]	0.686 [0-0.865]	0 [0-0.118]
	(f) During this hospital stay, how often did nurses listen carefully to you?	1851	0.059** [0.018-0.096]	0.034** [0.006-0.063]	0.029** [0-0.053]	0.012** [0-0.019]	0.885 [0.696-0.931]	0.445 [0.115-0.62]	0.785 [0-0.879]	0.214 [0-0.304]
	(g) During this hospital stay, how often did nurses explain things in a way you could understand?	1853	0.015 [0-0.041]	0.016** [0-0.38]	0 [0-0.018]	0 [0-0.004]	0.645 [0-0.839]	0.273 [0-0.463]	0 [0-0.702]	0 [0-0.094]
	(h) Using any number from 0 to 10, what number would you use to rate this hospital during your stay?	1853	0.017* [0-0.041]	0.009* [0-0.022]	0.012* [0-0.03]	0.004* [0-0.008]	0.682 [0-0.842]	0.167 [0-0.371]	0.604 [0-0.788]	0.08 [0-0.163]
	(i) Would you recommend this hospital to family and friends?	1828	0.03* [0-0.064	0.026*** [0-0.054]	0.021* [0-0.044]	0.012** [0-0.021]	0.793 [0-0.89]	0.382 [0.015-0.562]	0.729 [0-0.85]	0.217 [0-0.293]

permutation test: *p<0.01; **p<0.05; ***p<0.001 CI: 95% = confidence interval; ICC1 = Intraclass correlation 1 (variance); ICC2 = Intraclass correlation 2 (reliability)

5.5 Discussion

In this paper we describe fundamental methods to investigate measurement properties for quality assessments, particularly using data on patient experiences with care, for healthcare provider profiling. We also explore likely reasons why provider profiling based on patient experience data often fails to achieve the intended goal: to accurately rank units or institutions based on quality of care. We support our position by assessing both ICCs for four GS-PEQ and five HCAHPS items on the unit and hospital levels. Sufficient between- and within-provider variance and reliability – indicated by satisfactory ICC1 and 2 values – are essential to produce reliable and valid comparisons of providers, e.g., units or hospitals. However, as our example demonstrated, few items yielded satisfactory ICCs: together with plotted results, none of the 9 items tested showed sufficient between-provider differences to allow accurate profiling. Therefore, we would not recommend any of the tested items for provider profiling.

In our example, we describe, examine and assess of several analytical approaches that guide the appraisal of items proposed for provider profiling. The calculated ICC1 is one useful indicator of between-provider variance. However, it remains questionable whether a threshold value is practical, and if so, where that level should be set. Even when the suggested threshold of $\geq$0.05 [44] was reached, sufficient between-provider variance was found in only two of the 123 analyzed units. This begs the question of whether it is appropriate to discuss sufficient variance when only 1.6% (2/123) of sample units differed significantly from the grand mean. Furthermore, we discovered that the same principle applied at the institutional level: while 4 (=17.4%) of the 23 included hospitals had been identified as deviants, our calculated ICC1 value indicated insufficient variance to justify such a conclusion. Therefore, instead of a vaguely-defined threshold for the ICC1, we suggest using a percentage value that shows what proportion of providers differ significantly from the grand mean. One possible basis for this assessment is between-provider variation as depicted in the caterpillar plot that quantified the deviants. Based on our example, we would recommend using at least a 10% between-provider difference to indicate meaningful variance and to identify deviants. Because it is critical to distinguish statistically significant and clinically relevant profiling results [29], our findings support both calculating and visualizing (i.e., plotting) variance, as well as abandoning the concept of an ICC1 threshold in favor of a minimum percentage of divergence from the mean to determine meaningful levels of variance.

A caterpillar plot can visualize the calculated ICC1, enabling identification of deviants and providing a visually clear result beyond an abstract number. Furthermore, a histogram verifies between-provider variance in several ways. One is that, based on the reach of a 95%-CI, it indicates at a glance whether that interval includes 0: which is whether the variance depicted is statistically significant. Wider CIs than 95% decrease the uncertainty of the ICC1 results. Similarly, a histogram conveniently shows the distribution of ICC estimates. A normal distribution follows a classic bell shape; a skewed one indicates irregularities regarding ICC estimation, which is particularly a concern in generalized linear mixed models such as logistic or poisson models.

Future research in the field of patient experience measurement for provider profiling would profit from assessment of the outlined analytical approaches, e.g., the use of ICC1 and ICC2 calculations to interpret 95%-CIs and visualize the results (via histograms and caterpillar plots). We recommend exploring all analytical approaches together, as plots often indicate characteristics and relationships not noticeable via other means. However, regardless of which indicators are used to describe between-provider variance, the magnitude of that variance is not considered by provider profiling methods [15]. Therefore, all indicators have to be interpreted with caution and with the understanding that statistical significance does not necessarily equate with clinical relevance.

For this sample of 123 units across 23 hospitals, neither calculated nor plotted

analytical approaches, including for the adjusted models (i.e., those adjusted for patient and hospital confounders) indicated sufficient between-provider variance to allow reliable profiling. Furthermore, the literature shows that confounder variables, lack consistency regarding their influence on profiling results [16, 62]. In order to avoid misinterpretations of methods and results, the Swiss Academy of Medical Sciences (SAMS) recommends describing both crude and risk-adjusted values [43].

To determine measurement error, we calculated ICC2 values for all items. Compared to the unit level (n = 123), no hospital-level item (n=23) reached the threshold of ≥0.80. This was likely due to the differences in providers‘ sample sizes. Especially for cases with extremely large or small samples, the influence on the results is difficult to assess. Thus, it is unclear whether the results reflect actual between-provider differences or simply random effects relating to sample size [47].

Also, particularly in analyses including individuals, less reliable results can result in misclassification [10, 63]. To avoid reductions in reliability due to small hospital-level sample sizes, we also performed provider profiling at the unit level. However, the response rate varied between participating units. It is possible that with larger sample sizes, outcome variable reliability would improve [49].

Although patient experience data are widely used for provider profiling, the results of which are used to select positive or negative deviants, the current conceptualization of the construct of patient experiences requires clarification. For example, experts‘ disagreement about the content and main dimensions of patient-centered care leaves these concepts prone to ambiguity [64]. The resulting confusion is accompanied by problems with measurement and insufficient between-provider variation – resulting in low ICC1 values.

Furthermore, patient experience assessments need to be up-to-date. Changes in patient attitudes and perceptions also relate to health care settings. For instance, the HCAHPS survey was developed more than 15 years ago. Researchers should consider updating and re-confirming its conceptual foundations.

The lack of variance could also arise at least partly from the phrasing of the questions. In our study, we compared one item of the GS-PEQ questionnaire ((a) Did the nurses talk to you in a way that was easy to understand?) with a similar one from the HCAHPS questionnaire ((g) During this hospital stay, how often did nurses explain things in a way you could understand?). Both items represent the “communication” dimension and are similar regarding content, but differ regarding their wording and answer options. In our example, the GS-PEQ‘s response scale, with 5 points versus the HCAHPS‘s 4, provided greater variance between patient responses [65]. The literature regarding the ideal number of answer options is contradictory; however, in this case, more scale points led to more useful information. Additionally, if necessary, scales with more points can easily be recoded into simpler ones [65].

The measurement limitations discussed here – particularly the lack of variance – apply not only to subjective outcomes such as patient experiences, but also to clinical outcomes such as adverse event rates. One good example is van Dishoeck et al.s (2011) study assessing nine outcome variables (including pressure ulcers, hospital readmission) in patients with acute myocardial infarction [15]. Based on their findings, pressure ulcer prevalence and mortality rates were not recommended for provider profiling.

Limitations

Along with overall response rates of units and hospitals, response numbers per unit varied in our sample, influencing the reliability of the measures. Further, the small hospital-level sample size limited the statistical power, including the capacity to detect differences between hospitals. Therefore, we also assessed the unit level (n=123), which also indicated very limited between-unit variance. However, we were only checking whether differences existed between providers, not quantifying what differences we noted [15]. Additionally, one could argue that our threshold for ICC2 values (≥0.8) is too high: other literature

suggests lower levels [66]. Accepting a lower ICC2 level would have allowed more variables. However, higher ICC2 values reduce the level of noise in measurements and ensure high reliability, ultimately producing more accurate results [67].

5.6 Conclusion

Provider profiling based on patient experience surveys can influence patients‘ hospital selection, and partly determines the allocation of health care funding, particularly in the U.S. More importantly, considering its potential for improving the quality of care, experts agree on the need for valid and reliable methods to detect, measure and compare between-provider quality variances [49, 67]. Crucially, the capacity to assess between-provider variance allows the identification of positive or negative deviants, accelerating quality development; however, accurate assessment depends on the further capacity to reliably separate statistically relevant ‘signal’ from confounding ‘noise’ [49]. Unfortunately, patient experience measures rarely fulfill the criteria for reliable provider profiling. In this study, based on our ICC1 and ICC2 calculations, in spite of using data from 123 units in 23 hospitals, not one of the 9 mentioned questionnaire items provided data that fulfilled the necessary criteria. In order to assess the viability of the measures employed in provider profiling, all methodological approaches for analyses have to be explored. To maximize identification of deviating providers, we recommend augmenting ICC1 results with visualizations including caterpillar plots and histograms. Finally, considering the broad application of patient experience surveys in health services research, further studies are needed to develop and evaluate patient experience measures more suitable for provider profiling.

5.7 Acknowledgments

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5.8 References

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Chapter 6

Preferences matter when measuring patient experiences with hospital care – A cross-sectional multi-center study

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6.1 Abstract

Importance. How hospital patients‘ preferences shape their ratings of patient-centered care (PCC), thereby influencing provider profiles and health care funding decisions, has long been the subject of extensive theoretical discussions; however, only limited empirical evidence supports a relationship between patient preferences and PCC ratings. Therefore, this multicenter study had two objectives: to rigorously assess and analyze relationships between patient preferences and PCC levels, then to examine those preferences‘ values as predictor variables regarding the between-provider variances used in provider profiling.

Design, setting, participants. A cross-sectional multi-center study of 2159 adult patients from 142 units in 25 Swiss hospitals.

Measurements. We used a 13-item multiple-choice questionnaire survey to assess patients preferences and their perceptions of key PCC indicators (e.g., clinician-patient communication, patient involvement in care/treatment decisions), as well as gathering comorbidity and demographic data (age, gender, educational level).

Results. Of the 2159 patients included, most (87%) were always treated with courtesy and respect; however, only a third (31.4%) always received detailed information about their prescribed medications‘ side effects. Further, all 13 PCC items indicated an imbalance between patient perceptions of PCC levels and their preferences, i.e. lower perceptions compared to higher preferences. Between-provider variances were predominantly increased in models incorporating patient preferences as predictor variables: of the 13 models developed, the 9 adjusted to test preference variables yielded the highest between-provider variances.

Conclusions. In the assessment of perceived PCC levels, patient preferences are an important predictor variable. Therefore, they have to be included in risk adjustment methods when analyzing levels of PCC. Due to improved differentiation between providers, patient preferences are also crucial to institutional profiles.

6.2 Introduction

Hospital patient care experience measurements provide snapshots of health care quality, helping administrators monitor and improve patient-centered care (PCC) [1]. Surveys to assess patient care experiences, e.g., the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) in the US and the National Health Service (NHS) Adult Inpatient Survey in Britain are widely used to evaluate the current situation, detect potential for improvement and define improvement strategies. Mainly, assessments focus on the question of how, given the resources available to them, hospitals can best meet patients‘ needs.

However, patient experiences are challenging to measure. Current assessments suffer from three interrelated issues. First, measurements suffer from ceiling effects, i.e. a large majority of patients rate their experiences in hospital very positively [2-4]. Currently, the identification of high- and low-performing hospitals (called provider profiling) is unreliable because the commonly used patient experience items fail to detect sufficient between-provider variance [46]. However, consistent provider profiling has far-reaching consequences for stakeholders in health care settings. For health policies to encourage high care quality, for example, pay-for performance decisions must include accurate comparisons: in the US, 25% of total performance scores are based on patient experiences (assessed via the HCAHPS) [5]. In other countries, hospitals‘ patient care experience ratings are compared and reported publicly [4, 6, 7], allowing patients to base their hospital choices on the results.

In theory, hospitals can also benefit from provider profiling: negative deviants can treat their results as opportunities to receive improvement information from their high-performing peers. However, for this to work in practice, relatively fine between-provider variances have to be identifiable. For clinical outcomes, previous studies have highlighted the importance of sufficient between-provider variance to fair and reliable provider comparisons [8-10]. For patient experience ratings, similar research is lacking, but will represent a first step toward quality improvement in health care.

The second problem is uncertainty about how patient and hospital characteristics influence PCC ratings. While adjustments for patient demographics (age, gender, education, health status) are commonly accepted [6, 7, 11], the current evidence is inconclusive regarding those associations‘ strength and direction. Furthermore, hospital characteristics such as urban location [12], larger size [13], private ownership [14], a teaching function [15], and even the presence of an intensive care unit [15] can all negatively influence patient experience ratings.

Furthermore, comparing providers regarding quality of care, the literature shows little consistency regarding confounder variables (e.g., patient demographics) and their influence on profiling results based on patient ratings [10, 16, 17]. Such inconsistency makes it impossible to determine a core set of patient and hospital characteristics to include or adjust for in risk adjustment and provider profiling. However, reliable measurement and analyses of patient experiences certainly requires consideration of patient preferences.

The third underlying problem involves the definition of key concepts. For example, patient-centered care (PCC) is defined as “care that is respectful of and responsive to individual patients‘ preferences, needs, and values and ensuring that patients values guide all decisions” [18 p. 3]. Providing care according to this definition begins with assessment of patient preferences. For example, while some patients prefer to be fully involved in decisions regarding their treatment and care, others expect clinicians to make all treatment and care decisions. In either case, the patient‘s care rating will reflect how well their expectations are met.

For research purposes, then, patient preference is likely a predictor variable for perceived PCC levels. Although the influence of preferences on patient perceptions of care

quality has been discussed theoretically [19-21] , empirical examination of this topic has been weak to date. Even where studies assess patient preferences or expectations regarding care, they are mainly cross-sectional, single-center works [22, 23], very lengthy [24], subject to high missing rates [20, 22] or developed and applied in contexts not fully comparable with OECD countries [25, 26]. Other studies assess patient preferences but associate them with demographics rather than care experiences [23, 27, 28]. Furthermore, as studies assessing preferences with single items [20] lack any focus on specific care aspects, they offer little opportunity to improve either clinical practice or resource deployment.

Therefore, this study has 4 aims: (1) to accurately assess levels of PCC in Swiss acute care hospitals; (2) to assess patient preferences regarding specific care aspects in Swiss acute care hospitals; (3) to examine associations between patients‘ preferences and their ratings of the PCC they experience, controlling for patient and hospital characteristics; and (4) to examine between-provider variance regarding patients‘ experiences with PCC by controlling for patient preferences and patient and hospital characteristics.

6.3 Methods

6.3.1 Design

This is an analysis of patient survey data from the “Matching Registered Nurse services with changing care demands” (Match^{RN}) study. A cross-sectional, multi-center study, Match^{RN} uses its two datasets (collected in 2015/2016 and 2017/2018) to examine changes in nursing care structures, processes, and patient safety indicators since the 2012 introduction of Swiss Diagnosis-Related Groups [29]. The current study uses only data from the 2017/2018 collection period because only that collection assess pateit prefernces.

6.3.2 Setting and sample

The 2017/2018 Match^{RN} study included 160 units from one rehabilitation hospital and 30 acute care hospitals across Switzerland‘s German, French and Italian regions. Patient survey questionnaires were distributed in participating institutions, where patients $\geq$18 years and hospitalized $\geq$ 24 hours were invited to complete the survey. Further details of the Match^{RN} survey methodology are reported elsewhere [29]. For this study‘s analyses we included 142 units from 24 acute care hospitals and one rehabilitation hospital, excluding seven pediatric units because the patients were all minors, and two others because patient data collection was not approved.

6.3.3 Variables and measurement

In addition to patient survey data we used publicly available Swiss Federal Statistical Office records on hospital type and size.

The patient questionnaire included 13 variables assessing patient preferences and experiences with PCC during their current hospital stay. The questionnaire used items from established scales, as well as adopted and self-developed items. Where necessary, scales were translated as appropriate to the patient group. All translations used the World Health Organization‘s systematic process of forward and back-translation. Before inclusion in the questionnaire, all questions were reviewed for cultural appropriateness by an expert panel of bilingual nurses, then pre-tested on patients.

6.3.4 Outcome variable: Patient perceptions of PCC levels

To ensure adequate assessment of patients‘ perceptions across PCC‘s five main dimensions, we allocated and adapted questions from the Generic Short Patient Experiences Questionnaire (GS-PEQ) [30]. Using a five-point Likert scale (range: 1 [never]to 5 [always]), patients indicated their responses to 13 questions. For details, see Table 6.2.

6.3.5 Explanatory variables: Patient preferences

Alongside patients‘ perceptions of PCC levels, we assessed their care preferences. For each item regarding PCC, patient preferences were determined with the answer options “very important” or “not so important”. While various definitions, conceptualizations and strategies exist to determine patient preferences, expectations and attitudes [21, 24, 26], this generic method of user feedback originated in Ulwick‘s business theory of outcome-driven innovation [31]. Assessing and considering patient preferences and needs is a key component of PCC. We hypothesized that differentiating these preferences according to their importance would help distinguish the relative values of patients experiences and perceptions, thereby increasing their variability; and increasing response variability would magnify between-provider variance.

6.3.6 Control variables: patient and hospital characteristics

Patient characteristics
For an overview of our patient sample, we included questions concerning demographics (gender [male/female]), age in years, educational level (0/“no school graduation” to 4/ “university degree”) and health status. For the latter, we used the Self-Administered Comorbidity Questionnaire (SCQ) [32]. Each of the SCQ‘s 13 items assess three aspects of comorbidity: (1) the presence of a disease; (2) whether the patient receives / has received treatment for this disease; and (3) whether the patient feels limited due to the disease. Summing the relevant aspect scores indicates the number of comorbidities (“comorbidity score”) and whether the patient feels limited as a result (“disability score”). Each of these scores ranges from 0 to 13 (e.g., 0 – 13 comorbidities, 0 – 13 of which limit(s) activity). To increase readability, we summarized the descriptive presentation in Table 6.1 to include “5 or more comorbidities” and “3 or more limitations”.

Hospital characteristics
We assessed and controlled for three hospital characteristics: language region (German, French or Italian); size (small: <100, medium: 100–300, large: 301–600, extra large: >600); and type (university, general or regional acute care or rehabilitation).

6.4 Data collection and management

For each unit, a contact person received paper questionnaires to distribute to all consenting eligible patients. For details, see Section “Sample description” below. Data collection followed a census approach: over a four-week data collection period, each unit defined 2–3 dates for questionnaire distribution. Overall, data collection ran from October 2017 until March 2018. Based on a dataset provided by an external data entry service, the study team checked all returned questionnaires for consistency and plausibility.

6.5 Analyses

For all included sample characteristics and variables, we determined descriptive statistics and frequency distributions. Next, controlling for patient and hospital characteristics

via Linear Mixed-Effects Modeling separately for each outcome variable, we explored associations between patient perceptions of PCC and patient preferences. To ensure reliable interpretation of methods and results, we followed the Swiss Academy of Medical Sciences (SAMS) guidelines regarding both crude and risk-adjusted values [11]. To examine how patient preferences influence between-provider variance, we calculated the Intra-class correlation 1 (ICC1). We did this for every 13 items in (i) an unadjusted model, (ii) a model adjusted only for the patient preference variable, and (iii) a model adjusted for the preference variable as well as all patient and hospital characteristic variables (gender, age, education, comorbidity score, disability score, and hospital size and type). A between-provider variance value of >0.05 was considered sufficient [33].

Following various analytical approaches [46], we calculated and visualized the between-provider variance to evaluate the level of variance between hospital units. To do so, we began by calculating the ICC1 according to the following formula

$$ICC1 = \frac{between\ provider\ variance}{between\ provider\ variance + within\ provider\ variance} = \frac{\sigma_u^2}{\sigma_u^2 \quad + \quad \sigma_e^2},$$

where the between provider variance (σ_u^2) is estimated by the level II variance estimate of an unconditional mixed model divided by the between provider variance plus the within provider variance (σ_e^2), which is the level I variance.

We have provided 95% confidence intervals (CI) for the estimates, along with histograms of the ICC1 estimates. To evaluate the ICC1s‘ stability, we produced caterpillar plots of the empirical Bayes estimates for the same models. Concerning the caterpillar plots, we also depicted the estimates‘ uncertainty graphically to identify positive and negative deviants. Missing data were dealt with via listwise deletion.

6.6 Results

6.6.1 Sample description

This study includes a sample of 2159 patients. The mean response rate across all units was 73.3% (range: 11.8% and 100%). Slightly more than half of participating patients were male (51.0%); the mean age was 64 years (range: 18 to 103 years). Almost one-third [29.9%) of patients self-reported no comorbidities; slightly more than half (56.2%) reported no limitations in their daily activities. Detailed information about our samples comorbidities can be found in Table 6.1.

Of the 25 participating institutions, 19 were general hospitals; the mean number of beds was 306 (range: 40 to 974). The majority (68%) of participating institutions were from the German speaking part of Switzerland.

6.6.2 Descriptive analysis

Patients‘ perceptions of PCC levels
Patients reported generally high PCC levels, with an overall mean “always” response rate of 57.7% (range: 43.1 to 87.3%) across the 5 main dimensions. For the first main dimension, “unique person”, 87.3% of patients responded “always”. The other four main dimensions‘ mean “always” ratings were 43.1% for “patient information” (range: 31.4% to 49.1%), 61.3% for “patient-clinician communication” (range: 48.8% to 67.5%), 46.8% for “patient involvement” (range: 36.7% to 61.0%) and 51.0% for “patient empowerment” (range: 44.7% to 57.3%). The frequency of missing data ranged from 5.7% (C1) to 27.6% (C9) (mean 15.3%). See Table 6.2 for detailed information.

Table 6.1: Patient characteristics

	n	%	NA n	NA %	mean	SD
Language						
German	1162	53.8				
French	340	15.8				
Italian	657	30.4				
Gender			108	5.0		
Male	1046	51.0				
Education			156	7.2		
No graduation	48	2.4				
Secondary school	373	18.6				
Further education/training	863	43.1				
Higher education	474	23.7				
University degree	245	12.2				
Age (years)	2051	95	108	5.0	64.12	17.57
Comorbidity/ies			-	-		
no	646	29.9				
1	470	21.8				
2	382	17.7				
3	278	12.9				
4	176	8.2				
5 and more	207	9.6				
Comorbidity/ies limited patient			-	-		
no	1213	56.2				
1	463	21.4				
2	225	10.4				
3 and more	258	11.9				

NA= Not Available; SD=Standard Deviation

Predictor variables: summary of care aspect preference ratings

Patients‘ preferences regarding the various dimensions varied widely. For example, almost all considered it highly important that the RNs treated them with courtesy and respect (96.7%) and that the information they received was easy to understand (96.3%). However, only two-thirds (70.5%) considered it important to involve the family in treatment/care. A large majority of surveyed patients rated each item as “very important” (range: 70.5% to 96.7%, mean 86.7%). The frequency of missing data for the preference variable ranged from 20.3% to 37.8%, with a mean of 29.6% (see Table 6.2).

Associations between patient experience, patient preferences, and patient and hospital characteristics

Patient preferences were strongly associated with all variables assessing PCC levels. To be precise, all models showed associations between patient perceptions of PCC levels and patient preferences. However, individual characteristics such as gender (C11) and disability score (C8) also played roles, along with comorbidity scores in two models (C7, C9). Additionally, hospital size and type played roles respectively in six (C1, C9, C5, C10, C13, C14) and four models (C5, C10, C13, C14). Neither age nor education had any significant relationship in any model. See supplementary file 1 for detailed information.

For every one of the 13 variables, the ratings for overall patient preference were higher than the perceived PCC levels. For example, while only one-third of patients always received detailed information about the side effects of prescribed medications, 87% considered it important. This imbalance between patient preferences and patient perceptions of PCC levels ranged from 9.4% (C1) to 55.6% (C12) (mean 34.4%).

Table 6.2: Patient perceived PCC levels and patient preferences

	Patients perceived PCC						*Patient preferences*		
Dimension **Item**	**Never** **n** (%)	**Seldom** **n** (%)	**Some-times** **n** (%)	**Often** **n** (%)	**Always** **n** (%)	**Not available** **n** (%)	**Very important** **n** (%)	**Not so important** **n** (%)	**Not available** **n** (%)
(1) Unique person									
(C1) The RNs treated me with courtesy and respect.	9 (0.4)	4 (0.2)	10 (0.5)	236 (11.6)	1776 (87.3)	124 (5.7)	1665 (96.7)	56 (3.3)	438 (20.3)
(2) Patient information									
(C7) I have received written, oral or online information about my treatment / care.	288 (15.6)	98 (5.3)	158 (8.6)	394 (21.4)	905 (49.1)	316 (14.6)	1246 (82.7)	260 (17.3)	653 (30.2)
(C9) I have received written, oral or online information about my discharge.	338 (21.6)	104 (6.6)	149 (9.5)	261 (16.7)	712 (45.5)	595 (27.6)	1001 (74.5)	342 (25.5)	816 (37.8)
(C11) I have received detailed information about the effects of my medication.	151 (8.0)	140 (7.5)	275 (14.7)	437 (23.3)	873 (46.5)	283 (13.1)	1357 (88.8)	171 (11.2)	631 (29.2)
(C12) I have received detailed information about the side effects of prescribed medications.	371 (20.2)	251 (13.7)	299 (16.3)	340 (18.5)	576 (31.4)	322 (14.9)	1294 (87.0)	194 (13.0)	671 (31.1)
(3) Patient-clinician communication									
(C3) There were opportunities to ask questions about my treatment and diagnosis.	46 (2.3)	49 (2.5)	136 (6.8)	415 (20.9)	1342 (67.5)	171 (7.9)	1556 (95.1)	80 (4.9)	523 (24.2)
(C4) The information given to me was easy to understand.	7 (0.4)	13 (0.7)	140 (7.0)	544 (27.2)	1293 (64.7)	162 (7.5)	1558 (96.3)	60 (3.7)	541 (25.1)
(C8) The RNs talked to me about being discharged from the hospital well in advance.	187 (11.3)	101 (6.1)	188 (11.4)	371 (22.4)	808 (48.8)	504 (23.3)	1117 (79.3)	292 (20.7)	750 (34.7)
(4) Patient involvement									
(C5) I was included in the decision-making process regarding my treatment and care.	19 (1.0)	26 (1.4)	137 (7.1)	569 (29.6)	1174 (61.0)	234 (10.8)	1405 (89.5)	165 (10.5)	589 (27.3)
(C6) Different treatment options were discussed with me.	286 (16.1)	159 (8.9)	261 (14.7)	419 (23.6)	651 (36.7)	383 (17.3)	1258 (84.4)	232 (15.6)	669 (31.0)
(C10) My family was involved in my treatment/care.	443 (24.3)	137 (7.5)	172 (9.4)	291 (16.0)	780 (42.8)	336 (15.6)	1048 (70.5)	439 (29.5)	672 (31.1)
(5) Patient empowerment									
(C13) I have received detailed information about the reasons behind my disease/diagnosis.	148 (0.8)	82 (4.6)	180 (10.1)	350 (19.7)	1021 (57.3)	378 (17.5)	1364 (92.9)	105 (7.1)	690 (32.0)
(C14) I know methods to minimize the impact of my health problems.	189 (11.3)	107 (6.4)	221 (13.3)	401 (24.1)	748 (44.9)	493 (22.8)	1254 (90.0)	140 (10.0)	765 (35.4)

ICC1 of unit-level outcome variables for one unadjusted and the two adjusted models
To assess the variance between the units, we calculated the ICC1 of the unadjusted model, the adjusted model with the preferences variable only and the adjusted model for all co-variables (preference variable, patient and hospital characteristics). Of the 13 models, 9 models met the ICC1 threshold of >0.05 (C7, C9, C11, C12, C3, C8, C6, C10, C14). For 6 of the 9 models met the threshold, the variance increased with predictor variable patient preferences (C7, C9, C11, C12, C3, C8). See Table 6.3 for detail information.

Visualization of ICC1 values
For the 13 variables, we visualized ICC1s for both adjusted and unadjusted models by plotting empirical Bayes estimates (supplementary file 2). Of the 13 variables, 11 showed variances between hospital units (range: 1 to 13 outlying units). However, the comparison between ICC1 and empirical Bayes Estimates was inconclusive. On the one hand, models with low ICC1 values showed differences when plotted; on the other, plotting highlighted no differences in models with sufficiently large calculated ICC1 values ≥ 0.05. For example, the adjusted preference model for variable C14 indicated a sufficient ICC1; however, its plot showed no outlying units. Additionally, calculated ICC1 values in the three different models revealed no clear trend in the plotted ICC1 values. I.e., even if the unadjusted model showed lower ICC1 values than did the adjusted ones, the visualization showed more between-unit variances than did the adjusted model.

Table 6.3: Calculated ICC1 with 95%-CI for unadjusted and adjusted models on unit level

	ICC1 [95%-CI]		
Variable	*Unadjusted model* [a]	*Adjusted preference model* [b]	*Adjusted all model* [c]
(C1) The RNs treated me with courtesy and respect.	0.006 [0 to 0.023]	0.011 [0 to 0.033]	0.002 [0 to 0.023]
(C7) I have received written, oral or online information about my treatment / care.	**0.079** **[0.044 to 0.114]**	**0.088** **[0.048 to 0.131]**	**0.075** **[0.037 to 0.114]**
(C9) I have received written, oral or online information about my discharge.	**0.074** **[0.043 to 0.112]**	**0.096** **[0.052 to 0.143]**	**0.068** **[0.026 to 0.113]**
(C11) I have received detailed information about the effects of my medication.	0.043 [0.02 to 0.07]	**0.066** **[0.032 to 0.103]**	**0.058** **[0.026 to 0.098]**
(C12) I have received detailed information about the side effects of prescribed medications.	**0.062** **[0.032 to 0.095]**	**0.068** **[0.033 to 0.108]**	**0.065** **[0.031 to 0.105]**
(C3) There were opportunities to ask questions about my treatment and diagnosis.	**0.061** **[0.033 to 0.093]**	**0.072** **[0.037 to 0.109]**	**0.063** **[0.029 to 0.101]**
(C4) The information given to me was easy to understand.	0.026 [0.006 to 0.048]	0.037 [0.011 to 0.066]	0.025 [0 to 0.057]
(C8) The RNs talked to me about being discharged from the hospital well in advance.	**0.119** **[0.079 to 0.164]**	**0.121** **[0.074 to 0.167]**	**0.102** **[0.056 to 0.152]**
(C5) I was included in the decision-making process regarding my treatment and care.	0.018 [0 to 0.04]	0.028 [0.001 to 0.056]	0.017 [0 to 0.046]
(C6) Different treatment options were discussed with me.	**0.082** **[0.048 to 0.116]**	**0.076** **[0.042 to 0.118]**	**0.066** **[0.031 to 0.107]**
(C10) My family was involved in my treatment/care.	**0.052** **[0.024 to 0.084]**	0.033 [0.006 to 0.063]	0.031 [0.004 to 0.066]
(C13) I have received detailed information about the reasons behind my disease/diagnosis.	0.046 [0.02 to 0.077]	0.040 [0.009 - 0.076]	0.033 [0.004 to 0.069]
(C14) I know methods to minimize the impact of my health problems.	**0.063** **[0.031 to 0.098]**	**0.055** **[0.02 to 0.09]**	0.037 [0.008 to 0.074]

[a] Unadjusted model with outcome variable only

[b] Adjusted preference model was controlled for patient preferences

[c] Adjusted all model was controlled for patient preferences and patient demographics (i.e., gender, age, education, comorbidity score, disability sum score, hospital size and type)

6.7 Discussion

In this study, we assessed patient preferences by analyzing patient importance ratings for the studied aspects of PCC. Almost unanimously (97%), participants considered courteous and respectful treatment very important, and two-thirds thought the same of family involvement. Comparison between these preference ratings and the corresponding experience scores allowed us to identify potential for improvement. For example, while over 90% of patients preferred to know the reasoning behind their diagnoses and methods to minimize the impact of their health problems, i.e., to be empowered via access to relevant information, only about half felt they had received such information. Evidence of such imbalances invites the development of PCC improvement initiatives, e.g., to increase patient knowledge of their medication and treatment plans. Furthermore, fulfilling one of this study's primary objectives, the inclusion of patient preferences in risk adjustment methodology in order to improve measurement of provider profiling by identify between-provider variance, allowing fairer and more useful comparisons. Many instruments assess PCC or their levels of satisfaction. The two concepts are not interchangeable [34]: the latter is an outcome of the former [35, 36]. In either case, though, the results are at best questionable. Besides their lack of clear conceptualization and standardized measurement regarding patient experiences, these measures are subject to severe ceiling effects [2]. The results–overwhelmingly positive patient ratings–provoke the question of whether assessments are even necessary. In fact, measurement bias issues have already led U.S. researchers to abandon some quality measures, such as those for smoking cessation counseling [37, 38]. Any suggestion, based on patient assessments, that care levels leave little room for improvement certainly requires close examination. It is far more likely that such results are limited by measurement problems.

Patient reported experience measures (PREMs, e.g., the HCAHPS and NHS survey) have been developed and implemented for performance assessment, provider profiling and quality improvement [39]. Although their development relied on patient input, though, none of the most widely-used patient experience with care instruments were developed specifically as PREMs; therefore, they measure patient PCC experience from the perspective of clinicians and researchers, not patients. Of course, even measures designed from the ground up as PREMs are always designed by clinicians and researchers. Unfortunately, patient involvement is often dispensed with entirely: a recent scoping review of the topic found that, of nearly 190 included studies, over a quarter featured no patient involvement whatever [40]; and not one involved patients in determining which outcomes should be measured [40]. This supports the argument that outcome assessments such as the NHS survey and the HCAHPS either undervalue or entirely ignore patients‘ points of view.

A primary PCC aim is to meet patient preferences and needs. However, as early as 2002, in a systematic review, R. Crow et al. noted critically that only 20% of their included studies on patient satisfaction also assessed patient expectations [41]. Our finding that PCC ratings offer, at best, a nebulous image of care quality, and less still of whether patient preferences are met, supports indications that these factor warrant separate assessment [34]. Still, to our knowledge, this is the first multi-center study to assess how patient preferences correlate with their PCC perceptions.

One major barrier to previous research was that satisfaction surveys‘ ceiling effects virtually eliminates between-provider variances. To expand those variances, we applied Ulwick‘s contemporary business theory of outcome-driven innovation [31], beginning with an assessment of patient preferences, with the aim of identifying opportunities for improvement. By weighing patients‘ preferences against their perceptions of specific aspects of PCC they received, we tackled different measurement challenges and strengthened our study in numerous ways.

First, even if patients‘ PCC ratings were also high and showed little variance, we

clearly determined which care aspects did not fit well with their preferences and needs. For each of the 13 variables, the perceived level of PCC was lower than the corresponding patient preference. That indicated that patient needs were not actually being met. Therefore, almost every care aspect can be seen as an improvement opportunity in Swiss acute care hospitals. Future research should assess the state of the art in other countries, while investigating reasons for the imbalance between patient preferences and perceived PCC levels. Identifying and exploring structures and processes impeding clinicians from meeting patient needs can yield successful quality improvement strategies.

Second, our analyses highlighted the statistical influence patients‘ preferences had on their PCC ratings. As noted above, ceiling effects distorted our view of patients‘ experiences; so we cannot make general recommendations regarding the inclusion of patient demographics in similar analyses. However, our results indicate that, in the analyses of perceived PCC levels, patient preferences are a vital co-variable. Additionally, considering the inconsistency of the evidence regarding patient demographics‘ effects on experience ratings [12, 13, 42] and risk adjustment methods for provider profiling [10, 17], the question can be raised as to which co-variables matter most regarding patients‘ experiences with hospital care. To avoid misinterpretation, then, both unadjusted and adjusted models should be reported [11]. As current adjustments usually include only patient demographics and hospital characteristics [6, 7, 11], this group should be expanded to include patient preferences.

Third, recognizing that patient preferences are a key element of PCC [18] their assessment should be standard not only in the analyses of perceived PCC levels but also in everyday health care practice. Based on the observed imbalances between patients preferences and their perceptions of PCC, growth targets can be defined and improvement initiatives designed accordingly. Likewise, resources can be optimized to develop and implement improvement strategies where they are most needed.

Fourth, inclusion of patient preferences in ICC1 calculation improve measurement of provider profiling by assessing between-provider variances to usable levels. More than half of the models showed highest ICC1 values in the model adjusted for patient preference only, indicating a non-negligible influence of patient preferences on perceived PCC levels. Increasing variance by adding an additional predictor has been described elsewhere [43]. With increased provider differentiation, provider profiling can be used as intended: to clearly identify high and low-performing providers. Previous studies‘ use of ICC1 values for clinical quality indicators such as mortality and hospital readmission rates supported the crucial need for between-provider variance [8, 9, 44]. However, health care policymakers who use provider profiling to make funding decisions will need to start including patient preferences as a predictor variable in their risk adjustment.

This study has certain notable limitations. First, no conclusions regarding causality are possible due to the observational study design and cross-sectional survey methodology. Second, the study had a high rate of missing data (5.7% to 37.8%), especially regarding preference ratings but also in perceived PCC levels. Complicated wording, an overly long questionnaire or respondent (dis)satisfaction with hospital care are all possible reasons. However, because we currently cannot simulate clustering effects in multiple imputations, multiple imputation by chained equations could not be used to compensate for missing values. Third, although the study included hospitals from all three Swiss language regions, voluntary participation may have led to selection bias.

In conclusion, regarding the assessment of perceived levels of PCC, patient preferences are a vital predictor variable that must be considered in risk adjustment calculations. For hospital administrators and health care policymakers, the findings reported above underpin the need to include patient preferences in the comparison of PCC performance as a component of provider profiling.

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Ethical approval The survey was conducted anonymously. The Match^{RN} study received exempt status from all cantonal ethics committees responsible for the participating hospitals (EKNZ UBE 15/59). Informed consent by the patient was implied by filling out and returning the questionnaire.

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Chapter 7

Synthesis and discussion

7.1 Synthesis of key findings

The overall goal of this dissertation was to assess PCC in Swiss acute care hospitals and identify structures and processes associated with it. Further aims were to use advanced statistical methods to identify potential differences in PCC provision between units and hospitals and to explore opportunities to improve PCC data collection by tackling measurement challenges. First, the associations between hospital unit- and process-related factors and patient experiences with PCC were examined. The findings suggest links between hospital units‘ work environment factors and patients‘ PPC perceptions. To be precise, leadership, staffing and resource adequacy and implicit rationing of nursing care are clearly associated with PCC and should be considered when improving it (see Chapter 4). The results indicate quality improvement following Berwick‘s pathway of change [1] (see Figure 1.2, Chapter 1).

In a second step, potential between-unit and between-hospital differences in PCC delivery were identified via various advanced statistical methods, e.g., ICC1 and empirical Bayes estimates. The results showed low between-provider variance at both the hospital and unit level regarding PCC provision (Chapter 5). Possible explanations include ceiling effects in the measurement of PCC due to generic wording, or simply focussing on aspects of care that are unimportant to patients. As described in Chapter 1, in addition to the change pathway, quality-based selection theoretically offers a second pathway to quality improvement [1]. However, this study provides compelling evidence that, while PCC may improve through pathway selection, currently available patient experience surveys do not reliably identify differences between providers (see Chapter 5).

Third, based on the results of this dissertation‘ first two studies, an approach from business literature was applied to the hospital setting. That approach involves comparing patient preferences with their ratings of perceived levels of PCC. Where patient preferences outweigh ratings of PCC levels, opportunities exist for improvement. Applying this approach was assumed to resolve the issue of insufficient between-provider variance, as it led to stronger differentiation between high- and low-performing hospitals and units. Using this new way of depicting patient experiences with PCC highlighted significant gaps between patients‘ preferences and their perceptions of PCC levels. With increases in ICC1 values, differentiation between providers moved into a more reliable range, i.e., low- and high-performing hospitals could readily be identified. This study highlighted the crucial impact of patient preferences on measurements and analyses of their perceptions of PCC to identify areas for improvement and therefore to facilitate provider profiling. The findings demonstrate differences in hospital care providers‘ PCC performance levels, revealing a clear potential for quality improvement through selection.

Overall, this dissertation adds to the literature on PCC in acute care hospitals in light of the discussed pathways of quality improvement and the challenges in its measurement. Applying an idea from business literature, the dissertation offers a possible method of tackling assessment issues and makes suggestions to make PCC-linked provider profiling both more reliable and more usable. By examining imbalances between patients‘ preferences and their perceptions of the care they actually receive, this method helps identify areas for possible improvement. Using this as a starting point, bearing in mind the influences of the hospital structures and processes identified in the first study (Chapter 1), future work could tackle the improvement of PCC in Swiss and international hospitals.

7.1.1 Discussion of key findings

Definition, conceptualisation and measurement of PCC

For more than 20 years, researchers and clinicians have been discussing the concept of PCC. The need to acknowledge patients‘ authority regarding their own care is undisputed. In 1991, supported by NAM [2] a research team headed by Margaret Gerteis [3] developed

a broad conceptual definition focusing on two key elements: (1) every patient has personal demands; and (2) these demands are central to the entire caring process. However, how this definition can effectively be applied to daily practice remains uncertain: defining specific core PCC processes have turned out to be very difficult [4-6]. Considering the many health care systems subscribing to PCC principles, and the heterogeneity of their cultures, contexts, funding systems, settings, populations, structures and processes, no single widely accepted conceptualization exists for PCC practice.

In fact, while most models reviewed included at least two core dimensions of PCC–most commonly treating patients as unique individuals and ensuring that patients‘ values guide all decisions–virtually none included any measurement of patient preferences. Rather than attempting to unify or replace the many conceptualizations of PCC, this dissertation both acknowledges that patient preference data are an essential but virtually unmeasured component of nursing research, and suggests how to include them in the assessment process.

In line with Gerteis‘s original concept of PCC, both clinical practice and research demand the assessment and observance of patient preferences. This may result in counterintuitive practices. For example, some patients prefer involvement as partners in decisions regarding their treatment and care; others do not. From the point of view of PCC delivery, then, clinicians should comply as fully as is feasible (e.g., regarding informed consent) with these preferences. In research, particularly analyses of perceived PCC levels, this dissertation supports the consideration of patient preference as a predictor variable. Therefore, especially regarding the value of patient preferences, it contributes to the existing knowledge of PCC measurement.

Structures, processes and PCC

While a growing number of studies are exploring the micro-level associations between interpersonal factors and patient perceptions of PCC [7, 8], little is known regarding meso-level factors. For example, it is plausible that hospital- and unit-level structures and processes influence PCC provision. First, PCC implementation requires a culture change from a traditionally paternalistic view to partnerships between healthcare providers and patients [9, 10]; second, unit- and hospital-level factors may enable or hinder the provision of PCC [11]. This possibility is confirmed in Chapter 4, which reports the findings of a large Swiss multi-centre study exploring the associations between work environment factors and PCC [11].

That study indicated that the three most consistent factors to be significantly associated with PCC were perceived staffing and resource adequacy, implicit rationing of nursing care and nurse leadership. Regarding the latter of these, numerous previous studies agree that leadership is a key influencer of PCC provision [12-16].

To establish a culture of PCC, leaders need to create a shared vision and to cultivate an individual and collective sense of purpose regarding its provision [17, 18]. By focusing team members‘ energy, maintaining their enthusiasm [19] and encouraging positive engagement and performance [20, 21], this leads to increased satisfaction both of nurses and of patients [17]. As elements of leadership, a consistent approach, an open communication style and respectful interactions all help shape organizational values and requirements in creating a PCC culture [17, 20, 22].

The necessary leadership skills can be promoted and learned through education and training. For example, a clinical leadership programme in Switzerland demonstrated improvements within a 6-month follow up in leadership competencies in topics titled “inspire a shared vision”, “challenge the processes”, “enable others to act” and “encouragement” [23]. Still, cohesion between PCC‘s principles and its practice is only successful with the inclusion of all stakeholders involved in provision: both clinicians and patients must participate [13, 17, 24].

This dissertation found that PCC's strongest meso-level associations were with staffing and resource adequacy. Previous research has indicated the need for adequate staffing and resources not only to increase patients' satisfaction [25, 26] but to ensure their safety [27-29]. Similarly, applying PCC principles and fully supporting a culture of PCC, i.e., treating each patient as an individual with tailored communication, sufficient information to make informed decisions and involving them in their care needs, requires adequate resources.

The study results described in Chapter 4 included no association between objective staffing measurement and PCC, indicating a mismatch between perceived staffing adequacy and actual resources. This disconnect between objective and perceived staffing is a fertile basis for future research, e.g., to determine under which conditions nurses feel unsupported and how their perceptions might change with different staffing levels. As additional work environment factors including teamwork and interprofessional collaboration completed the construct of work environment, they need to be assessed in relation to improving PCC.

While previous studies have clearly associated interprofessional collaboration and teamwork with patient satisfaction [30-32], it remains to be seen whether they are similarly associated with PCC. Further, the nurse work environment in normal Swiss acute care hospitals is comparable with those of U.S. magnet hospitals [33]. Generally positive work environments may partly explain the high level of PCC in Switzerland. Changes to the work environment can influence the incidence of negative unit processes, e.g., implicit rationing of nursing care. In stress situations where resources are perceived as inadequate, Aiken et al. found that nursing care activities are rationed or omitted [34-36]. In a multi-centre study across 12 European countries, the most frequent care activities left undone were communication with the patient, followed by documentation and patent education [35]. This pattern was also found in US hospitals [37] and is supported by a recent review including 54 studies [38].

The effects of rationing and omission of care are far-reaching. Evidence clearly shows that care left undone undermines psychosocial care, i.e., carer-patient interaction, which is a key principle of PCC. This study's results (Chapter 4) and previous Swiss studies have demonstrated the negative associations between patient experiences – including their perceptions of PCC – and rationing of nursing care [11, 36].

Conversely, when nurses feel they have adequate staffing and resources, as well as supportive leadership, levels of rationing and omission of nursing care tasks fall, while patient perceptions of PCC rise. As both staffing and resource adequacy and leadership are hospital-level considerations, while care rationing and omission are unit-level processes, this example indicates how meso-level structures and processes can influence patients' perceptions of PCC quality.

Profiling hospitals based on PCC provision

Provider profiling, i.e., performance assessment and ranking, is used in health care both as a policy instrument and as a steering mechanism to improve the quality of health care across similar institutional settings [83-85]. The results offer are of interest to various stakeholder groups. They offer patients relevant information regarding hospital services, allowing them to compare and select care providers. Health care policy makers use them to assess the efficiency of hospital structures and processes in relation to quality of care [86]. In the US and the UK, profiling results depend significantly on performance measurement via, respectively, the HCAHPS and NHS surveys [39, 40]. However, due to a lack of between-provider variance and insufficient risk adjustment, the fairness and reliability of the comparisons they facilitate is questionable. This is true not only in the U.S and U.K. but also in Switzerland.

A consequence of reliance on these measures arose when Swiss researchers tried to use

2015 Match^{RN} study data on PCC to benchmark the participating Swiss hospitals (see Chapter 3). The classification of low- and high-performing hospitals (respectively negative and positive deviants) failed due to detected insufficient variance between providers Chapter 5. Different analytical approaches such as calculation of ICC1 and plotting of empirical Bayes estimates to detect the adequacy of between-provider variance for benchmarking purposes have not been applied to PCC data. In a related study Chapter 5 low ICC1 values and broad confidence intervals including 0 were determined and described. Additionally, visualisation via Empirical Bayes estimates, i.e., to graphically illustrate between-provider ranges, and uncertainty of the estimates gave a more complete picture.

Whichever approach is used, though, the results clearly showed that provider profiling with commonly used PCC items is unsuitable due to lack of the psychometric properties to distinguish between hospitals [82]. Considering the available evidence in the field of benchmarking with patient experiences, the majority of studies assess validity and reliability of their patient experience instruments [41, 42], but do not measure their ability of detect differences between providers [82]. However, this capacity is essential for an instrument intended to identify differences between providers. Moreover, the presence of ceiling effects in national and international studies in patient experience assessment [43, 44] should be seen as a signal that variance levels are critically low.

Still, provider profiling based on these or similar instruments is used for pay-for-performance calculations and hospital accreditation [45-48]. This makes the findings reported in Chapter 5 doubly alarming: they call into question not only profile-based funding, but also any accreditation processes for health care quality improvement based on similar data.

Regarding the question of whether benchmarking and accreditation improve patient and organizational outcomes [47, 49], this study provides evidence as to why they might be less effective than thought. As current provider profiling practice does not achieve its aim of reliably differentiating between low- and high-performing hospitals, it cannot be considered fair. A vast amount of the human and financial resources used for data collection, analyses, and reporting can be put to more productive use if measurement is fundamentally improved to identify areas for improvement.

Aside from the problem of distinguishing low- from high-performing providers, a further question exists regarding the influence of patient and provider characteristics in relation to risk adjustment in provider profiling (50, 51). Existing guidelines for risk adjustment recommend reporting both crude and adjusted values [40, 52, 53]. However, the same guidelines need to be applied consistently in studies using risk adjustment.

For example, a 2014 study reviewed 142 provider profiling reports (for 115 hospitals and 27 physicians) and assessed whether each report specified the comparison methods used [54]. Although only six of the 142 included no information regarding their assessment method, the level of detail varied widely, e.g., regarding the designation of the risk adjustment methods used [54]. To increase transparency, reliability and overall credibility, methods should be stated clearly, with a particular focus on between-provider variance [54]. This value impacts rankability. As it indicates "what part of the variation between the crude hospital [or physician] effects is due to unexplained differences as opposed to uncertainty" [55], it should always be indicated in provider profiling.

Additionally, the current measurement system, which typically yields very positive results, indicating virtually no differences between providers, undermines quality improvement. This study provides evidence that such low variance results not from uniformly high performance, but from insufficient sensitivity to detect differences between providers.

When performance and quality of care cannot be accurately assessed, indicators for quality improvement remain hidden. This dissertation does not entirely solve the problem of low between-provider variance in PCC-related performance assessments,

but draws attention to the problem, which is serious. With the application of various advanced analytical approaches, i.e., calculating ICC1 values and visualizing empirical Bayes Estimates, as well as providing calculated and visualized 95% confidence intervals, the lack of between-provider variance and the resulting uncertainty of any calculations based on them becomes clear. Until more efficient techniques can be found for indicating provider profiling results, these analytical tools have to be the new default.

Patient preferences as predictor variable

To differentiate more clearly between low- and high-performing providers, while incorporating patient preference information in the assessment process, a concept originally designed to simplify user feedback and spur innovation in business contexts was adapted. The result, a two-point scale (range: 0 (not so important) to 1 (very important)), alloweding to include each patient preference as a predictor variable. This provided two major benefits: crucial information regarding imbalances between patients‘ preferences and their perceptions of the care they received; and useful between-provider variances.

Including patient preferences as predictors in analyses indicated how fully clinicians were actually observing PCC‘s central concepts, i.e., providing care in consideration not only of patients‘ needs, but of their preferences. Moving away from the tradition of approaching patients with some variation of “What is the matter with you?” clinicians can adopt the motto, “What matters to you?” [56, 57]. This new perspective invites partnerships where, depending on their preferences, patients can play more or less active roles in their care while receiving coaching from the clinicians [56].

For research, this motto can be implemented in two ways. The first is by combining patient ratings of PCC with their preferences for all relevant care aspects. Regarding the concept of patient satisfaction, a 2002 systematic review noted critically that only 20% of studies assessing patient satisfaction also include data on patient expectations [58]. Similar claims can be made for PCC surveys: no commonly used instruments assess patient preferences. As noted above, to the best of the knowledge, this was the first multi-center study to assess the relationship between patient preferences and PCC perceptions. By identifying gaps between the two, it raises concerns as to how fully hospital PCC practices actually meet patient requirements. Furthermore, with some refinements, the method used to identify the differences offers a clear reflection of improvement potential on hospital units.

The second way to address the motto of “what matters to you?” is focussed on the survey development process. The key is the inclusion of the patient throughout the entire development process. For example, focus groups with patients, either using a storytelling approach or fictive case studies, are sources of valuable information. At the moment, patient reported experience measures (PREMs) (e.g., the HCAHPS and NHS surveys) are commonly used to assess patient related outcomes from the patient perspective. While not yet designed to measure PCC, these have been implemented in practice for performance assessment, provider profiling and quality improvement [59].

However, PREMs are currently developed and designed entirely by clinicians and researchers, with little or no patient involvement. A recent scoping review noted that in over one-fourth of its nearly 190 included studies, no patients were involved in the development of patient-reported outcome measures [60]. Nearly 60% of the studies involved patients in item development, most often in focus groups and interviews [60]. To test for comprehensibility, only half of the included studies used cognitive interviews or other methods involving patients [60]. Still, the review noted that not a single included study involved patients in determining which outcome should be measured [60]. This supports the position that outcome assessments such as the HCAHPS and the NHS survey do not address elements important to patients.

7.2 Strenghts and limitations of methods

This dissertation has three notable strengths:

The Match^{RN} study allowed a stable setting for refined measurement, making it possible to revise and improve measurements, as well as to examine the success of new components within the same setting and sample. In addition, a high response rate from Match^{RN}‘s large national sample, which represented all three Swiss language regions, provided a large and robust sample.

The application of state-of-the-art analytical approaches benefited this dissertation tremendously. To produce a detailed depiction, the multi-level structure was an obvious but useful choice. Generalized linear mixed models facilitated examination of the associations between variables (Chapter 4 and Chapter 6) on various levels. Also, mixed effect models were used in Chapter 5 to determine ICC1 and ICC2 values. Comparison of these and visualized empirical Bayes Estimates allowed a comprehensive evaluation of the between-provider variance. Finally, methodological flexibility allowed the adaptation and extremely effective use of techniques originating in economics and evolutionary biology.

However, Match^{RN} and this dissertation share four limitations regarding design, methodology and analyses. First, even with two time points for data collection, Match^{RN} remains a time-series cross-sectional study, because individual results cannot be followed; this precludes causal inferences. While rather broad generic measurements were appropriate for this study‘s bird‘s-eye-view perspective, assessments of specific phenomena also lack the detail necessary to be considered comprehensive. For example, to assess work environment factors more comprehensively, the assessement of teamwork and interprofessional collaboration could be done. Third, although the questionnaire was tested in all three language versions and adopted following feedback from patients, health literacy was not examined, resulting in unanswered survey questions. As is common in patient experience surveys, this study had a somewhat high rate of missing responses [61-63]. In addition to the provision of detailed instructions to the respondents, the use of simpler language in the survey questionnaire, with the aim of matching lower patient literacy levels, would likely have reduced the incidence of omissions [61]. Fourth, PCC must be developed as a cooperative effort between hospital staff and patients [64, 65]. Arguably, this research did not focus adequately on this co-operative aspect.

7.3 Implications for practise

Because PCC is a multidimensional construct provided in culturally and contextually diverse health care settings for heterogeneous patient groups, its measurement is challenging [6, 13]. Despite the recent emphasis on providing PCC, few hospital managers, practitioners and researchers evidently have fully recognized the complexity of its provision. For example, before attempting to implement PCC, factors on the micro and meso levels involving both leaders and care team members [9, 66] must be adjusted. This requires the full support of all relevant policy makers (i.e., macro-level actors).

When it is finally implemented on the micro level, care teams need to understand and respond to their patients‘ preferences regarding all relevant aspects of care. Regarding communication, for example, not only a lack of clear communication, but the provision of information not attuned to a patient‘s needs and preferences represents a failure of PCC [7, 66, 67]. Correcting such knowledge gaps requires a multi-step approach. First, hospital staff have to be trained in PCC communication and delivery of information, as well as patient engagement, involvement and empowerment. This preparation has to be included in the standard undergraduate training of health care professionals including nurses, physicians, therapeutic and rehabilitation practitioners, then regularly refreshed with continuing education [13].

Of primary importance, PCC demands forming a partnership with the patient, beginning with the question, "What matters to you?" [10, 56, 57]. This places the clinicians in a coaching role intended both to support cooperation between patients and their care teams and to engage them, in accordance with their preferences, in their own care [10, 56, 65]. Putting this principle into practice is a challenging goal. Engagement includes (1) providing all relevant information to the patient; (2) involving the patient in care processes by asking for their preferences and needs; and (3) building a partnership with the patient with shared leadership regarding treatment and care decisions [68].

As noted above, improvements to micro-level practices often require changes to meso-level structures, i.e., micro-level needs often drive meso-level changes. For example, to provide a high level of knowledge regarding PCC tools such as patient-centred communication or relationship building skills for health professionals, hospital managers can offer continuous education opportunities. Further, to enable health professionals to work with their patients in the context of a PCC culture, meso-level work environment factors need to be considered – in this case, strong leadership and adequate staffing and resources [11, 13, 15, 16]. Regarding resource and staffing adequacy, both objective measures, i.e., nurse-patient ratios, and subjective factors, i.e., nurse perceptions of sufficient resources, have to be adequate [11].

Further, to systematically identify patients‘ preferences and needs throughout their hospital stay, researchers from Sweden‘s Centre for Person-Centred Care in Gothenburg have suggested establishing individual narratives [69]. This would involve nurses working with patients individually to fill out daily joint bedside shift reports. As well as offering an opportunity to examine and discuss patient needs, this would encourage discussion of any new issues. Another possibility would be a coaching approach. Considering the importance of teamwork to the provision of PCC, Korner et al.‘s study of the concept of team coaching highlighted its usefulness [70]. Naturally, technological pathways are also available to assist in PCC implementation. It might be argued, for example, that recognizing patients as full partners in their care processes would include giving them joint access to their electronic health records. This should be feasible in all health care systems. The discussion of Jane Barnsteiner et al. support giving patients not only the opportunity to monitor their care but also the sense that their understanding and participation are valued [12]. Wherever PCC is provided, though, its provision demands that all involved stakeholders have adequate levels of resources, training and commitment. This includes macro-level actors, many of whose decisions and policies currently depend on provider profiling. However, as this dissertation shows, owing to methodological weaknesses, profiling is unreliable, showing few or no significant differences in actual PCC delivery.

Rather than confirming an actual lack of significant differences between providers, then, this dissertation‘s findings indicate that the measurement instruments and data analyses currently used in provider profiling lack the sensitivity to distinguish meaningful differences in care provision. Therefore, pending the implementation of reliable measurement of provider performance regarding PCC, hospital managers, health care policymakers and other stakeholders should regard provider profiling results with extreme caution.

7.4 Implications for reserach

While this dissertation project is complete, further research will be necessary in at least two directions: to expand the understanding of PCC‘s measurement, especially regarding the inclusion of patient preferences in analyses of delivery levels; and to explore the possibility of its continuous improvement via Berwick‘s proposed pathways of change and selection.

Several research considerations are recommended. First, given the diversity and complexity of health care systems [71], gathering input at every step from all relevant stakeholders via a mixture of both qualitative and quantitative methods is desirable. For example, at the stage of data collection, questionnaire surveys deliver more generalized (and generalizable) information compared to direct personal comments; focus groups yield more detailed statements, enabling a more comprehensive view. Both approaches will be necessary to address issues in PCC measurement, e.g., ceiling effects. Also, both to ascertain each patient‘s response to the question of “What matters to you” [57] and to use the results to differentiate between providers‘ performance, researchers must focus on increasing their instruments‘ sensitivity, e.g., by making questionnaire items as understandable as possible to all patients.

To deal with the ceiling effects that result from predominantly positive ratings, both strength-orientated and deficit-orientated approaches should be applied to hospital experience assessments. For example, in addition to asking about “what runs well”, items could ask “what did not run well”. An incremental approach incorporating a combination of methodologies will likely lead to steady improvement in PCC measurement. Another approach to the assessment of “things that run not well” during a hospital stay could be the storytelling approach [72]. Here, the interviewer can ask detailed questions to receive a deeper understanding and capture small but critical observations. Besides the questionnaire‘s item topics, its answer options can be reworked with the support of patients to increase their sensitivity and assess les pronounced differences.

Overall, the omission of patient preferences from analyses of PCC provision represents a major missed opportunity. The influence of these preferences as PCC predictor variables requires further investigation. To fulfill the basic requirements of PCC, patient preferences and needs have to be first requested, then assessed in ways that avoid guesswork or potential misconceptions [2]. As many patients may have trouble articulating these points, in-depth interviews or patient stories offer insights into both preferences and their potential associations.

Assuming the inclusion of patient preferences in the assessment of PCC, those preferences also need to be included in the analyses, i.e., in risk adjustment processes. Further studies will be necessary to tackle uncertainties regarding which predictor variables are actually significant to the assessment of PCC levels and to analyses of inter-provider differences [73-76]. To avoid misinterpretations of methods and results, reports should comply with reporting guidelines, which recommend supplying both crude and risk-adjusted values [40, 52, 53]. This includes the most common hospital (size, ownership status, types of hospital) and patient characteristics (age, gender, educational level); however, Chapter 6 clearly indicates the tremendous influence of patient preferences as an additional predictor variable. Another central issue regarding PCC measurement is provider profiling and its capacity to distinguish fairly between providers. To ensure fair and reliable comparison between providers in profiling methods, the item validity needs to be examined in relation to profiling purposes in every study dealing with between-provider differentiation. Therefore, the development of provider profiling methods should be further elaborated. The calculation of the between-provider variance should be a standard step in any analyses of items‘ suitability for provider profiling. As described in Chapter 5, this would allow constant quality improvement via the selection pathway.

To enable quality improvement through selection, though, research first needs to focus on the change quality improvement pathway. This demands the assessment of hospital and unit factors (e.g., staffing and resource adequacy, teamwork, interprofessional collaboration and readiness for change (an important factor for the implementation of any new practise [13, 77]), to examine their associations with patient perceptions of PCC.

Engaging fully in (i.e., “living”) PCC culture requires the identification of barriers impeding change commitment on the micro level and change efficacy on the meso level.

Overcoming these allows PCC to be implemented and improved [13]. Once units are ready to develop PCC, teamwork and interprofessional collaboration become the cornerstones of its provision [13, 70, 78]. These correlate positively with patient satisfaction [30-32]. Other enablers and beneficial processes and structures can be examined via focus group interviews with various stakeholders, e.g., health care professionals, hospital administrators and health care policymakers, with the aim of implementing the results in cross-sectional multi-centre surveys. Further exploration of enablers and barriers will facilitate intervention development.

Additionally, a deeper understanding is needed of patient-provider partnerships and how processes have to be structured to enable them. For example, to investigate the influence of nursing rounds or effective discharge planning on PCC levels from the very beginning of admission, survey studies could be conducted in various hospital service lines across a range of patient populations [66, 79]. Direct observations and/or focus group interviews with nurses would disseminate direct care deliverers‘ insights regarding process of daily care, while providing information about improvement potential and options. Findings could then be confirmed and elaborated via more generalised multi-center questionnaire surveys.

7.5 Implications for policy

As summarized in the previous sections, this dissertation‘s contents and results focus on three main issues concerning PCC: (a) how structures and processes can be arranged to improve PCC, i.e., improvement through change; (b) how provider profiling methods need to improve to make improvement through selection feasible; and (c) how PCC measurement itself can be improved. The results have several implications for policy.

Although the need for cost savings in health care is indicated, if these involve personnel reductions, they will likely come at the expense of PCC. Care according to PCC principles requires sufficient human resources–meaning not simply recommended nurse to patient ratios but also positive nurse perceptions of staffing adequacy (Chapter 4). In addition, for health care professionals to successfully live the PCC culture, they need training and continuing education. On the micro level, this includes topics such as communication and relationship building; meso level administrators can be trained in leadership for higher positions [13, 80]. And although teamwork and interprofessional collaboration are already covered by training, they require a specific focus and joint education of all involved care professionals. To support and facilitate partnerships, policy can promote information technology applications [80, 81].

Another essential element for full PCC provision is the engagement of patients, who must perceive themselves as equal stakeholders both in research and in their own care. Policy can foster and boost this by defining it as a criterion for allocation of research funding [13, 23]. Micro- and meso-level factors both contribute to macro-level policy outcomes such as benchmarking and accreditation. However, as noted above, due to inadequate between-provider variance, current provider profiling approaches regarding PCC items are limited in their contribution to quality improvement [82]. Lacking sufficient variances, it is impossible to reliably rank providers, increasing the likelihood of allocating false incentives. That is, while the high levels of PCC assessed via current instruments and methods are widely used for the allocation of funding to reward and incentivize quality improvement, data measurement deficits prevent any reliable analysis of patient perceptions in relation to PCC practice. Until this gap is bridged via a reworking of the relevant survey content and methodology, policymakers need to be aware that any incentives based on faulty survey data will motivate hospitals to improve their patient experience scores, not the quality of care they actually provide [76]. Developing meaningful policies that avoid such errors will require policymakers working

with researchers in the field to develop a PCC measurement structure reliable and valid enough to fulfil the needs of provider profiling [80].

7.6 Conclusion

Patient-centred care is not "nice to have" but a "must". Its core dimensions form a basis for the provision of quality of care and improvement of outcomes at all levels of health care [9, 13]. However, due partly to the complexity of the PCC construct and partly to the heterogeneity of health care settings in which it must be applied, practitioners, hospital administrators and policymakers face challenges in its provision. This dissertation explores opportunities to improve PCC provision both through micro- and meso-level changes and through improvements to measurement methods used in current empirical studies and provider performance comparisons.

At the meso level, nurse work environment shortfalls, especially deficiencies in resources and staffing, contribute to the micro-level outcome of implicit rationing of nursing care. Where this occurs, it correlates negatively with patient perceptions of care quality. Most notably, the analyses of patient hospital care ratings, which commonly play a decisive role in provider profiling and related decisions, a major methodological failure were observed inherent to all widely-used PCC measures, including those most often used for profiling. In the context of the treatment of patients as unique individuals, PCC has to measure not only how competently care tasks are performed, but also how fully those tasks match the patients personal needs and preferences. Nevertheless, none of these instruments include any measurement of patient preferences. Therefore, none can realistically determine how well those preferences are fulfilled.

As it is currently used, then, this indicates that provider profiling is based on unreliable methodology. To correct this problem, further robust study is urgently needed regarding both standard measures and individualized questions formulated to capture specific patients‘ preferences and needs. One promising framework for such work is Berwick‘s conceptualization of quality improvement via the two pathways of change and selection. After enacting the necessary macro-, meso- and micro-level changes, a two-scale PCC instrument could be developed to fairly, efficiently and effectively measure both patients‘ preferences and on their perceptions of the care they received.

To evaluate between-provider variances and to examine the usable of PCC items fully, the combination of calculated (i.e., ICC1 values) and visualised (e.g., plotted empirical Bayes Estimates) approaches offers state of the art results. The comparison of patients‘ preference data with their perceptions of PCC levels improves measurement of PCC not only by increasing between-provider variance but by providing a reliable reflection of improvement potential, thereby enabling long-term selection-based change.

7.7 References

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