Title: Trends and variability of implicit rationing of care across time and shifts in an acute care hospital: a longitudinal study

Running head: Trends and variability of implicit rationing of care

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Funding Statement: The proposed study was funded for 2 years (2018-2020) by the Medical Practice Plan, Faculty of Medicine, American University of Beirut, Lebanon

Conflict of Interest: Authors have declared no conflict of interest

Ethical Approval

The American University of Beirut Institutional Board granted permission to conduct this research project on June 1st, 2018 (SBS.2017-0418). Participating hospital informed us in writing its willingness to participate. Filling the surveys by RNs was considered as an informed consent.

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Article type : Special Issue Paper

ABSTRACT

Background: Implicit rationing of nursing care is associated with work environment factors. Yet a deeper understanding of trends and variability is needed.

Aims: To explore the trends and variability of rationing of care per shift between individual nurses, services over time, and its relationship with work environment factors.

Methods: Longitudinal study including 1,329 responses from 90 nurses. Intraclass correlation coefficients (ICC) were computed to examine variability of rationing per shift between individual nurses, services, and data collection time; generalized linear mixed models were used to explore the relationship with work environment factors.

Results: Percentage of rationing of nursing activities exceeded 10% during day and night shifts. Significant variability in rationing items was observed between nurses, with ICCs ranging between 0.20 and 0.59 in day shifts, and between 0.35 and 0.85 in night shifts. Rationing of care was positively associated with nurses' self-perceived workload in both shifts, but not with patient-to-nurse ratios.

Conclusion: Most variability in rationing over time was explained by the individual.

Implications for Nursing Management: Nurse managers and leaders need to develop and implement educational programs on implicit rationing of nursing care to strengthening nurses' skills related to decision-making, prioritization and time management.

1 INTRODUCTION

Implicit rationing of nursing care is an international phenomenon, defined as "withholding of or failure to carry out necessary nursing interventions due to a lack of nursing resources" (Schubert, Glass, Clarke, Schaffert-Witvliet, & De Geest, 2007). Rationing means that resources are scarce and not sufficient to provide all care that is required (Scott et al., 2018). Hence, in rationing, the individual nurse makes decisions about when and what type of nursing interventions patients receive. In the US, most studies explored the idea of "missed care" (Kalisch, Landstrom, & Hinshaw, 2009). In Europe, researchers explored the idea of rationing and prioritization of care (Schubert et al., 2007). In the review of the research conducted to date, Jones and colleagues reported that the concepts of missed care, care left undone, rationing of care and prioritization of care, all are addressing similar issues with substantial overlap (Jones, Hamilton, & Murry, 2015).

Continuous role conflict and guilt felt by nurses by focusing on the medical needs of the patient on the expense of social and relational aspects of patient care were reported (Papastavrou, Andreou, & Vryonides, 2014). Nurses in acute care hospitals reported an alarming amount of missed care, a related concept to rationing of care (Kalisch, 2006; Kalisch, Landstrom, & Williams, 2009). However, the reported level of rationing of care in existing studies is not consistent across care services. For example, nurses reported less rationing of care in US oncology units compared to medical and surgical units (Friese,

Kalisch, & Lee, 2013). Furthermore, 41% of nurses in Switzerland identified emotional and psychological support as most often rationed (Schubert et al., 2013). Similarly, in Germany and the UK, 82% and 46% of registered nurses (RNs), respectively, reported that talking to/comforting patients is the most often reported rationed nursing care (Ausserhofer et al.; Ball et al., 2016; Zander, Dobler, Baumler, & Busse, 2014). In the US, a previous cross-sectional study has shown that 44% of nursing participants reported rationing of patient assessment, while 73% of them reported failure to provide interventions and basic care to patients (Kalisch, Landstrom, & Williams, 2009). The commonly cited rationed activities were assessing the effectiveness of medication and surveillance of patients, timeliness of PRN medication administration, ambulation and positioning, hygiene, feeding, discharge planning, and communication (Gravlin & Phoenix Bittner, 2010; Kalisch, 2006; Kalisch, Landstrom, & Williams, 2009; Muzzana, Saiani, Mantovan, & Ausserhofer, 2018; Papastavrou, Andreou, & Efstathiou, 2014; Rochefort & Clarke, 2010). Rationing of patient and family support has been also reported among the frequent rationed activities when nursing resources are limited (Rochefort, Rathwell, & Clarke, 2016; Schubert et al., 2008).

The perceived effects of rationing on patients were raised by nurses who expressed concerns about patients losing confidence in the nursing staff, resulting in patient dissatisfaction (Papastavrou, Andreou, & Vryonides, 2014). Additionally, rationed/missed care is one of the major determinants of patient outcomes and mortality (Kalisch, Tschannen, Lee, & Friese, 2011). Recent findings indicate that each 10% increase in missed care is associated with 16% increase in the odds of a patient dying within 30-days of admission following common surgical procedure (Ball et al., 2017). Research also relates rationing to nurse staffing and mortality where nurses who have a high workload of patients to care for, have inadequate time to complete all required nursing tasks, and leave important care activities undone (Ball et al., 2017).

1.1 Conceptual framework

The "Rationing of Nursing Care in Switzerland" (RICH) model (Schubert et al., 2007), which guided our study, provides the definition for measuring rationing. Rationing depends on nurse's clinical decision-making and prioritization. The individual nurse performs or omits patient care influenced by organizational (e.g. type of shift; type of service) and environmental factors (e.g. workload, staffing adequacy). Our goal is to examine trends and predictors of rationing over 90 days, and across day and night shifts, in medical and surgical units based on the RICH conceptual framework model **(Figure 1).**

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In their systematic review, Griffiths and colleagues found that all studies so far which investigated implicit rationing of care and related concepts (missed care, unfinished care, care left undone, task left undone) were cross-sectional and did not account neither for shift differences, nor for individual differences, whether arising from specific characteristics (e.g. professional, skill and life-experiential variations) among nurses (Griffiths et al., 2018), or independent of some characteristics . Thereafter, is the variability of implicit rationing of care due to shift, service, or individual differences? Is the variability of implicit rationing of care related to work environment factors such as workload and staffing adequacy? Thus, deeper understanding of trends and variability over time and across shifts is needed to develop effective counter measures, including matching demand and supply of nurses, and making informed decisions regarding resource allocation. To address this gap, this study aimed to explore: 1) prevalence of rationing of care per type of shift; 2) between-individual , between-service and between-shifts variability of rationing of care; 3) trends and variability of rationing of care across time per type of shift and its relation to key work environment factors (self-perceived workload and staffing adequacy).

2 METHODS

This is a sub-study of the observational longitudinal project on implicit rationing of nursing care among Lebanese patients: RATIONAL. The parent study involved two phases of data collection, a cross-sectional (June 2018) and a longitudinal (September 1st to November 30th, 2018). It included 102 registered nurses (RNs) working on 10 medical, surgical, and pediatrics acute care units. The participating hospital comprises 304 beds and allows both shift models, the 8-hour (day, evening, and night) and the 12-hour shift (day and night). For further information regarding the parent study, please refer to the protocol paper (Dhaini et al., 2019).

2.1 Study design

The current paper includes data from the longitudinal phase only, which involved repeated assessments of rationing of care and workload. The longitudinal study design was employed because a cross-sectional design takes a snapshot of a single point in time and thus do not allow a comprehensive observation of the variability in rationing of care across time.

2.2 Sample and Setting

Our study included a convenience sample of nurses who met the eligibility criteria, including registered nurses working on medical/surgical/pediatric units; involved in direct patient care for at least one full month; and has worked at least 8 hours/ week on their unit. A total sample of 102 RNs was reached. The pediatric nurse responses were excluded from the original sample of 102 RNs due to the unique care needs of patients. The sample of 1,594 responses were hence received from a total number of 90 RNs. The included nurses were working day and/or night shifts on 8 medical and surgical units, within a single private teaching hospital in Lebanon, over 91 days (September 1st to November 30th, 2018). The hospital administration provided socio-demographic characteristics of the 102 RNs working on 10 medical, surgical, and pediatrics units in an aggregated form, as recommended by the American University of Beirut (AUB) Institutional Review Board (IRB) for anonymity.

2.4 Data sources

The current study used three questionnaires: 1) nurse personnel survey: captured implicit rationing of care and self-perceived workload; 2) nurse manager survey: provided staffing level on shift-basis; and 3) nursing administration survey: captured socio-demographic characteristics (age groups, gender, and years of nursing-experience) of RNs.

2.5 Data collection

Between September 1st and December 31st, 2018, equivalent to 91 days total (T1-T91), the participating nurses responded daily to the nurse personnel questionnaire. Three measurement periods captured our variables at the shift level, as follows: M1 (September 1st-September 30th, T1-T30) and M2 (October 1st-October 31th, T31-T61) refer to the first and second measurement periods, were collected during the day shifts only; M3 (November 1st-November 30th, T62-T91) refers to the third measurement period, was collected during the night shifts. Exceptionally, very few nurses worked evening shifts, which were included in the day shift analysis.

2.6 Study variables

Implicit rationing of nursing care was assessed using a modified version of the Basel extent of rationing of nursing care (BERNCA). Initially, BERNCA instrument is comprised of 20 questions divided into 5 dimensions and is used to assess nurse's inability to carry out necessary/required nursing tasks due to resource and time shortages using 4-point Likert scale (never, rarely, sometimes, often) (Schubert et al., 2007). The inter-item correlation

mean was 0.39, indicating good consistency of the scale with Cronbach` s alpha of 0.93 (Schubert et al., 2007).

In our study, we used 14 nursing activities from BENRCA instrument and RNs were asked to select the activities that were rationed on their current shift (0 = activity carried out; 1 = activity rationed). The 14 nursing activities included from the 5 BERNCA dimensions comprise: Support daily living activities: (1) *partial/ sponge bath*; (2) *skin care*; (3) *oral care*; Documentation: (4) *patient care plans*; (5) *documenting/evaluating care*; Rehabilitation, Instruction, Education: (6) *emotional/psychosocial support*; (7) *training/educating patients;* Monitoring/safety: (8) *positioning patients*; Caring and Support: (9) *preparing patients for tests/therapies*; (10) *assessment for newly admitted patients*; (11) *supporting patients with food/oral intake*; (12) *preparing patients for hospital discharge*; (13) *attending to patients who had rung promptly in less than 5 minutes*; (14) *monitoring patients*.

The time trend was measured as a continuous variable over 61 days (T1-T61) during the day shifts, and over 30 days (T62-T91) during the night shifts.

The weekend effect was assessed using the following variable: 0=weekday; 1= weekend/national holiday.

The *type of service* was captured using: 1=medical; 2=surgical.

Staffing level was assessed as patient-to-nurse ratio. The ratio was calculated by the number of patients divided by the number of RNs per service per shift as provided by the nurse managers.

Self-perceived workload was assessed using the six items of the NASA Task Load Index (NASA-TLX) scale (Hoonakker et al., 2011). The Cronbach`s alpha is 0.72 (Hart & Staveland, 1988). The NASA-TLX six-items scale measures how much mental (eg. thinking, deciding, calculating, remembering, looking, searching), physical (eg. pushing, pulling, turning, controlling, activating), temporal (eg. time pressure due to the task load), frustration (eg. feeling insecure, discouraged, irritated, stressed and annoyed), effort (eg. mental and physical effort to accomplish the required tasks), and performance (job satisfaction performance) demands are required to carry tasks at workplace on a scale of 0 to 100. To combine the six items into one score of workload, we calculated the unweighted average of the six items (Bustamante & Spain, 2008; Hoonakker et al., 2011; Soria-Oliver, López, & Torrano, 2018).

2.7 Data analysis

Data analysis was carried out separately for the day and night shift responses as a consequence of having two measurement periods for the day shift (M1 and M2) versus one measurement period (M3) for the night shift. To address aim 1, the prevalence of rationing of nursing care for each of the 14 activities was calculated. To examine the potential sources of clustering (i.e., between-group variations) in rationing of nursing care variability, we calculated the Intraclass Correlation Coefficient (ICC) for the repeated measures of the 14 rationing of nursing care outcomes in the day and night shifts respectively for between individual RNs, type of service (surgical versus medical), and data collection time. An ICC greater than 0.45 reflects a strong variability (Rosner, 2010). Given the design of the study and the presence of significant correlation within individual RNs in the day and night shifts, the percentage of rationing of nursing care for each of the 14 activities was calculated using mean response predictions from unadjusted empty generalized linear mixed models (GLMM) models with binomial family and logit link accounting for within-nurse correlation for each of the day and night shifts. In addition, multivariable GLMM models with binomial family and logit link were used to determine the association between rationing of each of the 14 activities and the following a priori selected independent variables entered simultaneously into the same GLMM model as fixed effects: weekend/holiday, workload, service, and patient to nurse ratio while considering the clustering of repeated rationing outcomes among individual RNs as random effects. The GLMM models for each of the 14 nursing activities were adjusted for the time trend (fixed effects) where rationing of nursing care was measured over 61 days (T1-T61) during the day shifts, and over 30 days (T62-T91) during the night shifts. Odd ratios (ORs) and 95% confidence intervals (CI) were reported in the GLMM models. All data analysis was conducted with $STATA_{14}$ and statistical significance was considered at p-value <0.05.

3 RESULTS

3.1 Nurses' responses and socio-demographic characteristics

A total of 1,594 responses were received from 90 RNs working day and/or night shifts. However, coded IDs were missing in 265 questionnaires. Some IDs had only one observation during the day or night shifts (**Figure 2**). Therefore, a total of 1,317 surveys from 90 RNs were included in the current study analysis, distributed as follows: 1042 responses from 64 RNs who worked day shifts, and 275 responses from 34 RNs who worked night

shifts. Out of the 90 total included sample, 8 RNs overlapped, as they worked both day and night shifts (**Figure 2**).

The socio-demographic characteristics were provided from the hospital management in an aggregated format for the total sample of 102 RNs. Most RNs (n=90; 88%) were females. Almost half of the sample (n=48; 47%) belonged to the young age group (20-25 years) and one third (n=36; 35%) age between 26 to 30 years old. The rest of the participating nurses belonged to other age groups (31 to 35: 3%; 36 to 40: 3%; 41 to 45: 4%; 46 to 50: 4%; and older than 50: 4%. A quarter of our sample was either novice (n=26: 25%) or had 6 to 10 years of experience. (n=24: 24%). Nearly one third of RNs (n=37; 36%) had two to five years of nursing experience. The number of senior nurses was not prevalent (11 to 15 years: 2%; 16 to 20 years: 4%' and greater than 20 years: 9%). Most RNs (n=90; 88%) worked in the medical and surgical units while only minority of RNs (n=12; 12%) worked in the pediatrics units.

3.2 Description of implicit rationing of care

Day shift

Overall, 64 RNs submitted 1,042 surveys during the day shift (T1-T61). Implicit rationing of care was common for 10 out of the 14 nursing care activities, when accounting for individual RNs (**Table 1**). The common rationed activities across time included: setting up patient care plans (23%), attending to patients calls in less than 5 minutes (19%), providing oral care (19%), and emotional/psychosocial support (19%). On contrary, preparing patients for tests/therapies and assessment for newly admitted patients were rationed the least at 6% and 7% of the time respectively.

The analysis of the ICCs in **Table 1**, indicated a significant variability between the individual RNs for the 14 nursing activities during the day shift, ranging from 0.20 to 0.59. The highest variability between RNs was detected for rationing of sponge bath (ICC=0.59) and attending to patients calls (ICC=0.53) while the lowest variability was observed in rationing of assessment for newly admitted patients (ICC=0.20). In contrast, the ICCs showed negligible variability between the type of service (surgical versus medical) and data collection time during the day shift.

Night shift

In total, 275 surveys were received from 34 RNs during the night shift (T62-T91). Implicit rationing of the 14 activities showed higher prevalence during the night shift as compared to the day shift and ranged between 12% and 35% (**Table 2**). The most rationed activities across time were emotional and psychosocial support (35%), setting up patient care plans (32%), monitoring patients as felt necessary (23%), preparing patients for tests and therapies (21%), and attending to patients calls (20%). On contrary, the least reported rationed activity was providing sponge bath (12% of the time).

The ICCs suggest significant variability between individual RNs, ranging from 0.35 to 0.85 for the rationing of the 14 nursing activities (**Table 2**). The highest variability between RNs was noticed in rationing of monitoring patients (ICC=0.85) and attending to patients' calls (ICC=0.82). Yet, only around one third (ICC=0.35) of the variability in rationing of support with food/oral intake was explained by the individual RN level. Concordant with the day shift results, the ICCs showed negligible variability between the type of service (surgical versus medical) and data collection time during the night shift.

3.3 Factors associated with implicit rationing of nursing care

Day shift

During the day shift, 8 out of the 14 nursing activities were positively associated with self-perceived workload **(Table 3)**; those were: rationing of skin care (OR 1.43, CI 1.26-1.62), oral care (OR 1.12, CI 1.003-1.26), setting up patient care plans (OR 1.43, CI 1.26-1.63), documentation and care evaluation (OR 1.17, CI 1.02-1.34), educating patients (OR 1.28, CI 1.12-1.47), positioning patients (OR 1.36, CI 1.17-1.58), attending to patients' calls (OR 1.37, CI 1.20-1.56), and monitoring patients (OR 1.44, CI 1.25-1.66). Rationing of care was not associated with patient-to-nurse ratio except for rationing of skin care which decreased (OR 0.67, CI 0.49-0.90) with higher patient-to-nurse ratio. The type of service (surgical vs. medical) did not have a significant effect on rationing of nursing care. Rationing of 2 out of the 14 activities was significantly noticed depending whether the working shift was on a weekend or holiday versus regular weekdays. Specifically, rationing of preparing patients for hospital discharge (OR 2.81, CI 1.75-4.51) was approximately 3 times higher on weekends and holidays while rationing of attending to patients' calls (OR 0.53, CI 0.33-0.84)

was approximately 2 times lower on weekends and holidays as compared to regular weekdays.

Night shift

A positive association was shown between rationing of 9 out of the 14 nursing care activities and self-perceived workload during the night shift **(Table 4)**. Those activities involved: rationing of sponge bath (OR 1.69, CI 1.10-2.61), skin care (OR 1.74, CI 1.21-2.49), oral care (OR 1.35, CI 1.00-1.80), setting up patient care plans (OR 1.38, CI 1.05-1.79), emotional/psychosocial support (OR 1.42, CI 1.11-1.81), educating patients (OR 1.61, CI 1.21-2.14), positioning patients (OR 1.81, CI 1.07-3.05), support with food and oral intake (OR 1.35, CI 1.05-1.74), and hospital discharge preparation (OR 1.48, CI 1.10-1.97). Implicit rationing of care did not show a significant association with patient-to-nurse ratio except for rationing of oral care (OR 0.63, CI 0.42-0.95) which decreased with increased patient-to-nurse ratio. The type of service (surgical vs. medical) did not correlate with any of the nursing activities. Three out of the 14 nursing activities were significantly less rationed on weekends or holidays compared to regular weekdays. Those include rationing of oral care (OR 0.21, CI 0.07-0.60), support with food/oral intake (OR 0.37, CI 0.14-0.97), and hospital discharge preparation (OR 0.35, CI 0.14-0.89).

4 DISCUSSION

This study incorporated repeated data to best characterize implicit rationing of care and examine factors related to rationing in a Lebanese acute care hospital.

The most reported rationed care activities by RNs during both the day and night shifts were patient care plans, attending to patients calls, and emotional/psychosocial support, which were consistent with previous existing findings (Ausserhofer et al.; Ball et al., 2016; Zander, Dobler, Baumler, & Busse, 2014). A novel finding of the current study is the pronounced correlation of the repeated implicit rationing of nursing care measure within the same individual nurse, indicating a variability in rationing observed between individual RNs. In contrast, there were no important variations between shifts and type of service (medical and surgical).

Our results highlight a potentially important role for the repeatability of implicit rationing of nursing care within the same nurse. For example, this may occur if the individual nurse has a similar role or works under similar conditions. Other plausible explanations could be related to the nurses' job training, personal characteristics, variations in response to job demands,

and personal accountability. For example, personal and socio-demographic characteristics, and higher personal accountability, were all found significantly associated with decreased missed care (Srulovici & Drach-Zahavy, 2017). Moreover, researchers have also been interested in whether the quality of patient care is sensitive to the skill mix of the nursing staff (Oppel & Young, 2018). They described that nurses' individual perceptions of staffing adequacy were related to positive patient experiences and quality of care (Oppel & Young, 2018). Future investigations are recommended to measure repeated implicit rationing and to account for it; additionally, studies are needed to assess how certain factors including social factors, education (Jones, 2015; Schubert et al., 2013) and personal accountability (Srulovici & Drach-Zahavy, 2017) may influence individual variations in implicit rationing of nursing care.

Our analysis positively correlates self-perceived workload with implicit rationing of care in both types of shifts, which corroborated a body of empirical literature. In Australia, nurses have reported that the processes to address workload issues were suboptimal, which may be leading to implicit rationing of care (Hegney et al., 2019). Increasingly, nurses are struggling to manage required care in available time (Kirwan, Mathews, & Scott, 2013). In addition, nursing management has not been able to adequately address workload issue due to financial constraints imposed by hospitals as a way to increase profitability (Everhart, Neff, Al-Amin, Nogle, & Weech-Maldonado, 2013). Reduced time and resources that occur, resulting from economic influences, impact nurses' capacity to complete necessary care work (Willis et al., 2015). Our findings are plausible and may benefit nurse managers to promote interventional program including education of nurses on prioritization and time management.

Another major finding is that while our model identified a correlation between self-perceived workload and implicit rationing of care, it did not identify any relationship with the objective staffing level measure, the patient-to-nurse ratio. This result is counter intuitive and might be related to the lack of sensitivity of the instrument or the high degree of individual judgements on what care activities might be required or both. The optimal dosing of the number of nurses caring for patients remain elusive (Driscoll et al., 2018). However, to determine adequate nurse staffing levels, managers need to take the underlying determinants into consideration, which are patient factors (e.g. acuity and dependency levels), unit factors (patient throughput), and nurse characteristics (number and skill level) (Excellence, 2014). Therefore, our assumption requires further investigation since the current study did not account for both patient acuity and skill mix (e.g. licensed practical nurses and nurse aids); two key variables, which objectively influence staffing level. Additionally, staffing level -

patient to nurse ratio variable- was a constant measure of staffing resources, hence invariant, in the participating hospital. It is worth to mention that the inverse relationship between patient-to-nurse ratio and rationing of skin care during the day and oral care during the night is likely due to multiple testing.

Overall, implicit rationing of care activities during weekend/holidays tend to be less frequent, except for patients' preparation to hospital discharge during weekend day shifts. Results also indicate less rationing of oral care and food/oral intake support during night shift on weekend/holiday in comparison to typical type of shift on weekdays. In practice, nurses tend more to promptly respond to patient alarms (in <5 min) and offer more support to patients on weekends/holidays due to a decreased patient turnover, in comparison to regular weekdays. This can be further supported by the positive association found between weekend/holidays and implicit rationing of patient preparation to hospital discharge during the day shift, which suggests that patient discharge preparation is not nurse-perceived as a necessity on the weekend, as patients are seldom discharged on that day of the week in the participating hospital center.

5 STRENGTHS AND LIMITATIONS

To our knowledge, this is the first longitudinal study on self-reported implicit rationing of nursing care and measuring this concept on a shift-level, contributing to more comprehensive data on its variability and predictors. Longitudinal studies allow for identification and relation of events to particular set of exposures, establishing sequence of events, accounting for the effect of each individual during analysis, and reduction of recall bias during data collection (Caruana, Roman, Hernández-Sánchez, & Solli, 2015).

Despite its strengths, the current study partakes some limitations. First, it included only a single hospital, in addition to the convenience sampling approach, which may not represent the country at large, hence not allowing generalizability. However, it is worth to mention that within that setting, the survey response rate was very high reaching 100%. Second, response bias is a common phenomenon in healthcare research where self-reported data are used (Rosenman, Tennekoon, & Hill, 2011). There are several reasons individuals might offer biased rating of self-assessed behavior, ranging from misunderstanding of what a necessary task is to social-desirability bias, even if the survey was anonymous (Rosenman et al., 2011). In addition, we could not adjust for the socio-demographic characteristics of the RNs in GLMM models due to AUB IRB restrictions that allowed us to collect socio-demographics in an aggregated manner only from the nursing administration. Thirdly, ward

environmental elements were missing in the repeated survey (i.e. in the longitudinal phase of the study) in order to make it manageable to fill and capture information but not reduce response rate. Finally, our analysis was based on observing rationing of care through a linear time trend in the generalized linear mixed models. Time trends such as lagged time effects was not accounted for since our focus was the direct shift effect of working conditions in relation to rationing of care. Therefore, further research is needed to examine the lagged effect of working conditions on rationing of nursing care.

6 CONCLUSIONS

Our study suggests that implicit rationing of nursing care is prevalent in both, the day and night shifts. Most of the variability in rationing of care was explained by the individual, yet not by the type of service nor by data collection time. Self-perceived workload was positively associated with rationing across shifts while staffing level was not. This emphasizes the major role of individual RNs in rationing of care regardless the type of service, type of shift, and staff adequacy measures.

Future research should concentrate on more objective measures for implicit rationing of nursing care such as nurse's skill mix (e.g. licensed practical nurses and nurse aids), patient factors (e.g. acuity and dependency levels), and unit factors (patient throughput). Furthermore, future research should address trends, variability and determinants of implicit rationing of nursing care according to the hospital context and the expected roles/responsibilities of the nursing staff. Additionally, investigating the qualitative aspect of rationing over time is needed in order to explore nurses' experience and perceptions and the rationale for implicit rationing of care. The unit and the organization culture should also be addressed qualitatively whereby nurses and patients can express the cultural "agreement" on the type of activities that can be rationed by RNs.

7 IMPLICATIONS FOR NURSING MANAGEMENT

Our findings add to the existing literature on rationing of care by describing rationed activities on a shift-level basis and over time, in addition to the nursing activities that are mostly rationed. Accordingly, nurse managers need timely and accurate information to make appropriate decisions when prioritizing and allocating resources to best meet patient care needs. Educational and awareness programs for nursing leaders, managers, and RNs on the concept of rationing of care, its impact on nurses and patients, as well as time management and prioritization skills are needed taking into consideration the importance of individual

RNs in rationing of care. Furthermore, nurse managers can raise awareness, among their nursing personnel, about the concept and values related to rationing of care, including ethical principles and procedures for fair allocation of nursing care to patients. Additionally, we recommend nurse managers to work on strategies that can alleviate the self-perceived workload. A suggestion could be organization of regular small meetings and discussions between nurse managers and RNs with similar nursing experience profile to better understand the implications of rationed care in relation to self-perceived workload and explore suggestions that can improve the status quo.

8 ETHICAL APPROVAL

The AUB IRB granted permission to conduct this research project on June 1st, 2018 (SBS.2017-0418). Participating hospital informed us in writing its willingness to participate. Filling the surveys by RNs was considered as an informed consent.

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Figure 1. Descrption of the longitudinal survey responses

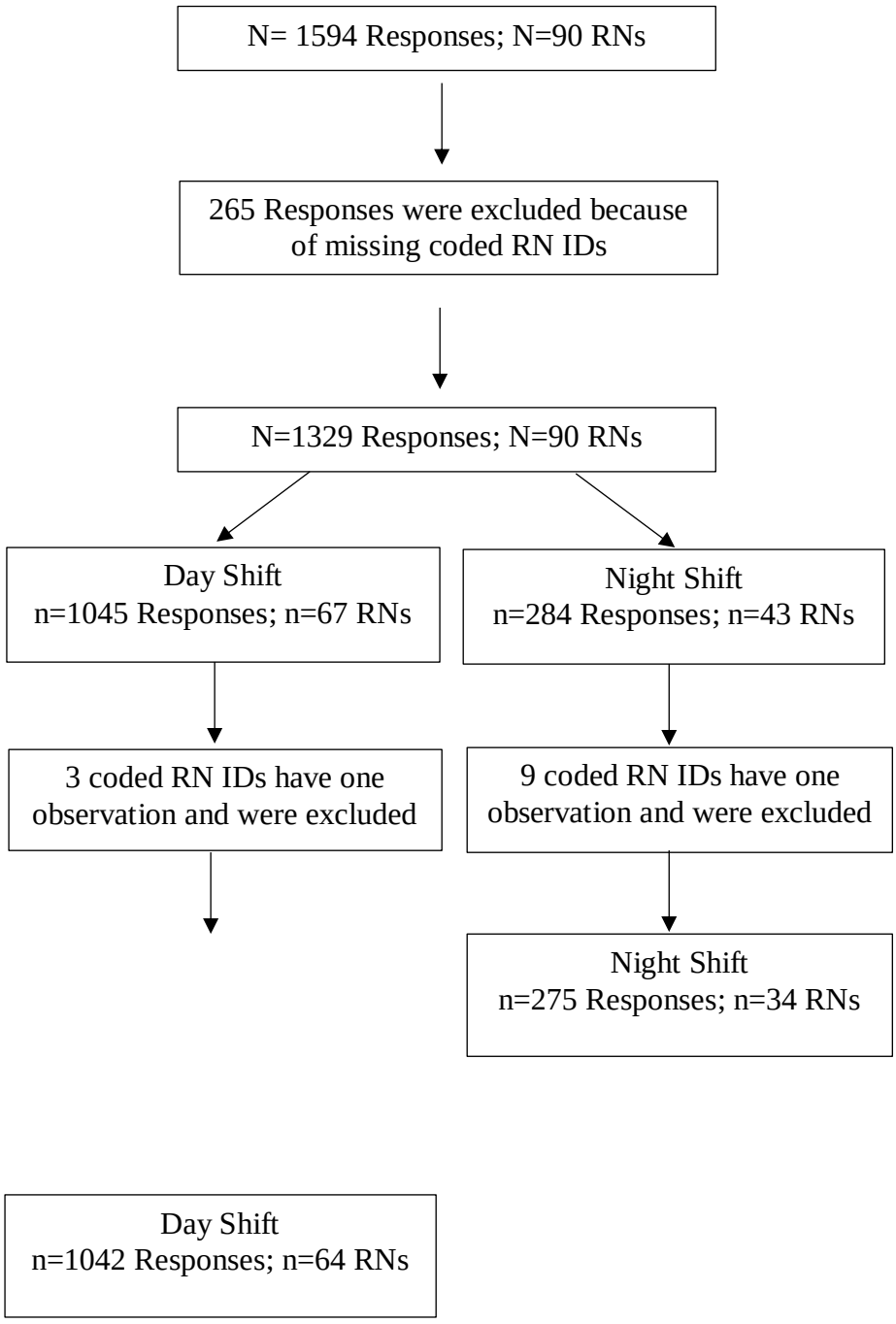

Table 1. Description of implicit rationing of nursing care during the day shift (n=1042, n=64 RNs)

Activities	% of rationing of care	Intraclass correlation coefficient (ICC)		
		[a]RN ID	[b]Service	[c]T1-T61
Rationing of supporting ADLs				
1.Partial or sponge bath	12.39%	0.59*	0.004	0.04
2.Skin care	18.26%	0.44	0.004	0.01
3.Oral care	19.15%	0.42	0.007	0.03
Rationing of documentation				
4.Setting up patient care plans	23.38%	0.38	0.00	0.02
5.Sufficiently documenting/evaluating care	11.30%	0.29	0.00	0.003
Rationing of rehabilitation, instruction, education				
6.Emotional/psychosocial support	18.95%	0.50*	0.00	0.03
7.Training and education for patients	9.17%	0.45*	0.00	0.01

Rationing of Monitoring/safety				
8.Positioning patient as necessary	11.15%	0.39	0.00	0.04
Rationing of caring & support				
9.Preparing patients for tests or therapies	5.71%	0.45*	0.00	0.00
10.Assessment for newly admitted patients	6.89%	0.20	0.001	0.00
11.Support with food/oral intake	12.25%	0.54*	0.00	0.04
12.Preparation for hospital discharge	9.17%	0.32	0.00	0.13
13.Attending to patients' calls <5 minutes	19.10%	0.53*	0.01	0.01
14.Monitoring patients as closely as felt necessary	14.72%	0.41	0.01	0.00

*ICC ≥ 0.45 indicates strong variability between individual RNs.

[a] RN ID: ID for each individual RN; [b]Service: 1=Medical service, 2=Surgical service; [c]T1-T61: data collection time for day shifts.

Table 2. Description of rationing of nursing care outcomes during the night shift (n=275, n=34 RNs)

Activities	% of rationing of care	Intraclass correlation coefficient (ICC)		
		[a]RN ID	[b]Service	[c]T62-T91
Rationing of supporting ADLs				
1.Partial or sponge bath	11.80%	0.79*	0.04	0.00
2.Skin care	21.80%	0.72*	0.00	0.00
3.Oral care	22.05%	0.57*	0.00	0.00
Rationing of documentation				
4.Setting up patient care plans	31.90%	0.59*	0.00	0.01
5.Sufficiently documenting/evaluating care	19.98%	0.78*	0.00	0.00
Rationing of rehabilitation, instruction, education				
6.Emotional/psychosocial support	35.36%	0.50*	0.06	0.00
7.Training and education for patients	26.54%	0.52*	0.00	0.05
Rationing of Monitoring/safety				
8.Positioning patient as necessary	16.96%	0.83*	0.00	0.00
Rationing of caring & support				
9.Preparing patients for tests or therapies	20.77%	0.50*	0.00	0.00
10.Assessment for newly admitted patients	18.61%	0.63*	0.00	0.00
11.Support with food/oral intake	17.83%	0.35	0.04	0.00
12.Preparation for hospital discharge	26.54%	0.58*	0.01	0.002
13.Attending to patients' calls < 5 minutes	20.02%	0.82*	0.00	0.00
14.Monitoring patients as closely as felt necessary	23.30%	0.85*	0.00	0.00

*ICC $\geq$ 0.45 indicates strong variability between individual RNs.

[a]RN ID: ID for each individual RN; [b]Service: 1=Medical service, 2=Surgical service; [c]T62-T91: data collection time for night shifts.

Table 3. Generalized linear mixed model of Rationing of nursing care in the day shift (n=1,042 responses, n= 64 RNs)

	Partial or sponge bath OR [95% CI]	Skin care OR [95% CI]	Oral care OR [95% CI]	Setting up patient care plans OR [95% CI]	Sufficiently documenting/ evaluating care OR [95% CI]	Emotional/psychosocial support OR [95% CI]	Training and education for patients OR [95% CI]
[a]T1-T61	0.97 [0.96, 0.98]*	1.00 [1.00, 1.02]	0.98 [0.97, 0.99]*	0.98 [0.97, 0.99]*	0.98 [0.96, 0.99]*	0.97 [0.96, 0.98]*	0.98 [0.97, 0.99]*
[b]Weekend/ holiday	1.36 [0.81, 2.26]	1.43 [0.94, 2.17]	0.89 [0.60, 1.33]	1.06 [0.72, 1.56]	0.92 [0.58, 1.46]	0.99 [0.65, 1.53]	0.88 [0.54, 1.41]
[c]Workload	1.15 [1.00, 1.33]	1.43 [1.26, 1.62]*	1.12 [1.003, 1.26]*	1.43 [1.26, 1.63]*	1.17 [1.02, 1.34]*	1.13 [1.00, 1.28]	1.28 [1.12, 1.47]*
[d]Service	0.85 [0.23, 3.16]	1.18 [0.42, 3.31]	0.57 [0.23, 1.44]	1.27 [0.47, 3.43]	1.28 [0.54, 3.04]	1.52 [0.52, 4.48]	0.86 [0.30, 2.49]
[e]Patient to nurse ratio	1.02 [0.71, 1.47]	0.67 [0.49, 0.90]*	0.90 [0.67, 1.19]	1.16 [0.89, 1.52]	1.29 [0.93, 1.78]	1.17 [0.87, 1.57]	0.97 [0.70, 1.35]
	Positioning patients as necessary OR [95% CI]	Preparing patients for tests/therapies OR [95% CI]	Assessment for newly admitted patients OR [95% CI]	Support with food/oral intake OR [95% CI]	Preparation for hospital discharge OR [95% CI]	Attending to patients calls in less than 5 minutes OR [95% CI]	Monitoring patients as closely as felt necessary OR [95% CI]
[a]T1-T61	0.97 [0.95, 0.98]*	0.98 [0.97, 1.00]	0.97 [0.96, 0.99]*	0.96 [0.95, 0.97]*	0.99 [0.98, 1.00]	0.97 [0.96, 0.98]*	0.98 [0.96, 0.99]*

[b]Weekend/ holiday	1.03 [0.63, 1.68]	1.41 [0.77, 2.57]	1.13 [0.66, 1.91]	0.83 [0.51, 1.36]	2.81 [1.75, 4.51]*	0.53 [0.33, 0.84]*	0.77 [0.48, 1.23]
[c]Workload	1.36 [1.17, 1.58]*	0.99 [0.84, 1.16]	0.97 [0.84, 1.12]	1.14 [1.00, 1.31]	1.09 [0.94, 1.26]	1.37 [1.20, 1.56]*	1.44 [1.25, 1.66]*
[d]Service	1.02 [0.36, 2.90]	1.03 [0.33, 3.22]	1.45 [0.66, 3.20]	1.04 [0.32, 3.38]	0.81 [0.33, 1.98]	0.81 [0.26, 2.54]	2.27 [0.81, 6.36]
[e]Patient to nurse ratio	1.09 [0.77, 1.53]	0.98 [0.65, 1.50]	1.04 [0.72, 1.50]	1.09 [0.76, 1.55]	0.90 [0.64, 1.27]	0.79 [0.56, 1.10]	0.93 [0.67, 1.28]

* P-value < 0.05.

[a] T1-T61: data collection time for day shifts; [b] Weekend/holiday: 0=weekday, 1= weekend or holiday; [c] Workload: unweighted mean score of six scales (mental, physical, temporal, frustration, effort and performance demands); [d] Service: 1=Medical service, 2=Surgical service; [e] Patient to nurse ratio: number of patients ÷ number of registered nurses per service per shift.

Table 4. Generalized linear mixed model of Rationing of nursing care in the night shift (n=275 responses, n= 34 RNs)

	Partial or sponge bath OR [95% CI]	Skin care OR [95% CI]	Oral care OR [95% CI]	Setting up patient care plans OR [95% CI]	Sufficiently documenting/ evaluating care OR [95% CI]	Emotional/psychosocial support OR [95% CI]	Training and education for patients OR [95% CI]
[a]T62-T91	0.98 [0.92, 1.06]	0.96 [0.91, 1.03]	0.96 [0.91, 1.01]	0.94 [0.90, 0.99]*	0.94 [0.89, 1.00]	0.96 [0.92, 1.00]	0.90 [0.85, 0.95]*
[b]Weekend/ holiday	0.98 [0.27, 3.53]	0.80 [0.26, 2.49]	0.21 [0.07, 0.60]*	1.23 [0.54, 2.82]	1.19 [0.43, 3.30]	1.43 [0.65, 3.14]	1.82 [0.75, 4.39]
[c]Workload	1.69 [1.10, 2.61]*	1.74 [1.21, 2.49]*	1.35 [1.00, 1.80]*	1.38 [1.05, 1.79]*	1.09 [0.79, 1.49]	1.42 [1.11, 1.81]*	1.61 [1.21, 2.14]*
[d]Service	4.65 [0.35, 61.74]	1.30 [0.17, 9.77]	0.85 [0.16, 4.56]	1.96 [0.36, 10.78]	0.97 [0.10, 9.12]	0.31 [0.08, 1.29]	0.68 [0.12, 3.85]
[e]Patient to nurse ratio	0.98 [0.58, 1.64]	1.05 [0.65, 1.70]	0.63 [0.42, 0.95]*	0.90 [0.64, 1.26]	1.11 [0.72, 1.70]	1.13 [0.82, 1.55]	1.24 [0.86, 1.78]
	Positioning patients as necessary OR [95% CI]	Preparing patients for tests/therapies OR [95% CI]	Assessment for newly admitted patients OR [95% CI]	Support with food/oral intake OR [95% CI]	Preparation for hospital discharge OR [95% CI]	Attending to patients calls in less than 5 minutes OR [95% CI]	Monitoring patients as closely as felt necessary OR [95% CI]
[a]T62-T91	0.87 [0.79, 0.94]*	0.95 [0.90, 0.99]*	0.96 [0.91, 1.01]	0.98 [0.93, 1.02]	0.96 [0.92, 1.01]	0.90 [0.84, 0.97]*	0.93 [0.87, 0.99]*
[b]Weekend/	0.33 [0.06, 1.78]	1.63 [0.69, 3.81]	0.88 [0.34, 2.31]	0.37 [0.14, 0.97]*	0.35 [0.14, 0.89]*	0.61 [0.18, 2.06]	0.47 [0.13, 1.67]

holiday							
[c]Workload	1.81 [1.07, 3.05]*	1.29 [0.98, 1.72]	1.26 [0.91, 1.74]	1.35 [1.05, 1.74]*	1.48 [1.10, 1.97]*	1.23 [0.83, 1.82]	1.19 [0.83, 1.71]
[d]Service	2.85 [0.18, 45.47]	0.68 [0.14, 3.23]	0.50 [0.08, 3.32]	0.47 [0.15, 1.47]	0.47 [0.09, 2.42]	2.05 [0.18, 23.11]	2.01 [0.15, 27.04]
[e]Patient to nurse ratio	1.04 [0.55, 1.98]	1.24 [0.88, 1.75]	0.68 [0.46, 1.03]	0.87 [0.60, 1.25]	1.19 [0.82, 1.75]	0.90 [0.54, 1.49]	0.87 [0.52, 1.45]

* P-value < 0.05

aT62-T91: data collection time for night shifts; b Weekend/holiday: 0=weekday, 1= weekend or holiday; c Workload: unweighted mean score of six scales (mental, physical, temporal, frustration, effort and performance demands); d Service: 1=Medical service, 2=Service; e Patient to nurse ratio: number of patients ÷ number of registered nurses per service per shift.

Figure 1. Conceptual model* based on the *Implicit Rationing of Nursing care Framework* (Schubert et al., 2007)

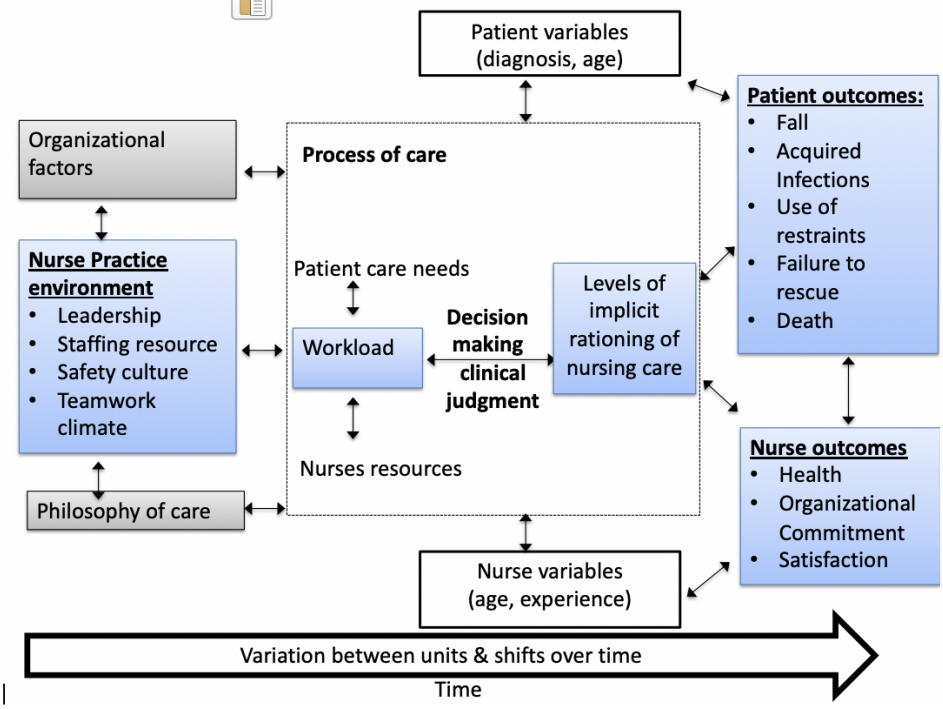

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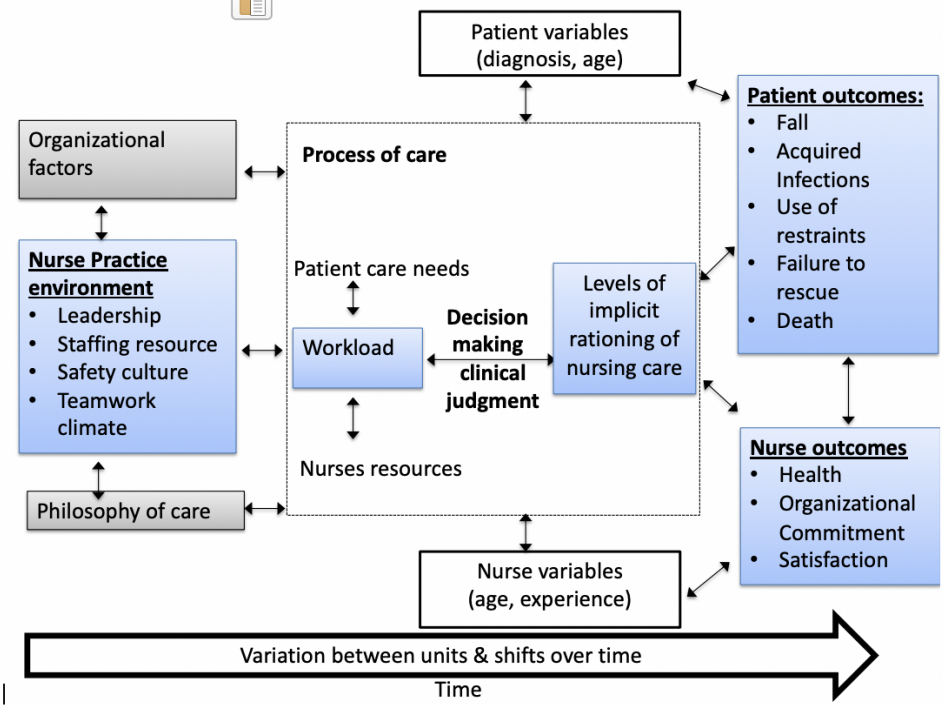
Figure 1. Conceptual model* based on the *Implicit Rationing of Nursing care Framework* (Schubert et al., 2007)



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