

Title: Correlates and predictors of missed nursing care in hospitals

Running head: Correlates and predictors of missed nursing care

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ABSTRACT

Aims and objectives: To identify the contribution of hospital, unit, staff characteristics, staffing adequacy and teamwork to missed nursing care in Iceland hospitals.

Background: A recently identified quality indicator for nursing care and patient safety is missed nursing care defined as any standard, required nursing care omitted, or significantly delayed, indicating an error of omission. Former studies point to contributing factors to missed nursing care regarding hospital, unit and staff characteristics, perceptions of staffing adequacy as well as nursing teamwork, displayed in the Missed Nursing Care Model.

Design: This was a quantitative cross-sectional survey study.

Methods: The sample were all registered nurses and practical nurses (N=864) working on 27 medical, surgical and intensive care inpatient units in 8 hospitals throughout Iceland. Response rate was 69.3%. Data were collected in March-April 2012 using the combined MISSCARE Survey-Icelandic and the Nursing Teamwork Survey-Icelandic. Descriptive, correlational and regression statistics were used for data analysis.

Results: Missed nursing care was significantly related to hospital and unit type, participants' age and role, and their perception of adequate staffing and level of teamwork. The multiple regression testing of Model 1 indicated unit type, role, age and staffing adequacy to predict 16% of the variance in missed nursing care. Controlling for unit type, role, age and perceptions of staffing adequacy, the multiple regression testing of Model 2 showed that nursing teamwork predicted an additional 14% of the variance in missed nursing care.

Conclusions: The results shed light on the correlates and predictors of missed nursing care in hospitals. This study gives direction as to the development of strategies for decreasing missed nursing care, including ensuring appropriate staffing levels and enhanced teamwork.

Relevance to clinical practice: By identifying contributing factors to missed nursing care, appropriate interventions can be developed and tested.

Key words: hospitals, missed nursing care, nursing, teamwork

What does this paper contribute to the wider global clinical community?

- The findings of this study indicate a significant contribution of hospital, unit and staff characteristics and nursing teamwork to missed nursing care in hospitals in an entire nationalized health care system. Unit type, role, age and staffing adequacy predicted 16% of the variance in missed nursing care and teamwork alone predicted an additional 14% to the variance of missed nursing care.
- These findings build on studies which show that missed nursing care exists across health care systems, cultures and countries and is influenced by teamwork, and staffing adequacy as well as other variables.

INTRODUCTION

A recently identified quality indicator for nursing care and patient safety is missed nursing care (MNC). MNC is defined as standard, required nursing care omitted, or significantly delayed, indicating an error of omission. A number of studies from different countries in the world have been carried out on MNC or care left undone and incomplete. These studies point to several contributing factors to MNC regarding hospital, unit and staff characteristics as well as nursing teamwork.

Background

Regardless of setting and country, among the most frequently identified missed nursing care is basic care such as ambulating and turning patients, mouth care, feeding patients on time, comfort talk with patient and family, patient teaching, medication administration on time, documentation and attending interdisciplinary rounds (Al-Kandari & Thomas 2009, Ball et al.

2013, Kalisch et al. 2012b). The most frequently identified reasons for missed nursing care seem also to be universal; the work environment, staffing, patient load, material resources and communication (Al-Kandari & Thomas 2009, Ball et al. 2013, Kalisch et al. 2012b). Studies carried out in US hospitals indicate missed nursing care to be related to hospital, unit and staff characteristics and nursing teamwork predicting patient and staff outcomes. A study comparing missed nursing care in hospitals with Magnet versus non-Magnet status revealed a significant difference in missed nursing care and reasons for missed nursing care. Magnet hospitals had significantly less overall missed nursing care and reported reasons due to communication and labor resources significantly less frequently than did participants from non-Magnet hospitals (Kalisch & Lee 2012b). Unit type may also be a contributing factor to missed nursing care. When comparing missed nursing care in oncology units and other units, study results showed significantly less overall missed nursing care in oncology units (Friese et al. 2013).

In a recent study using data from 419 general acute care hospitals in the USA, the relationship of missed nursing care and work environment to 30 day readmissions of patient with heart failure was identified. The data included 20605 professional bedside nurses and over 160930 patients. Study results indicated missed nursing care to be an independent predictor of heart failure readmissions, however in most cases depending on whether the work environment was good or poor. More missed nursing care and more readmissions were identified in units with poor work environments (Carthon et al. 2015). Another study from the USA including 124 patient units in 11 hospitals, showed the mediating effects of missed nursing care on the relationship of staffing measured as hours per patient day (HPPD) and patient falls. Less HPPD were significantly related to more patient falls, were missed nursing care was found to be a mediating factor (Kalisch et al. 2012c).

A number of staff characteristics have been identified to be related to missed nursing care. In a study including nursing staff from 10 hospitals in the US, significantly more missed nursing care was reported by females, older RNs, those working day shifts, those with more experience, those who had missed more days of work in the past three months, those who perceived staffing in their unit to be less adequate, and those caring for more patients during their last shift (Kalisch et al. 2011a). Another study carried out in 18 units in one hospital in the US revealed that RNs reported significantly more missed nursing care as well as labor and material resources as reasons, than did nursing assistants (Kalisch 2015).

Yet another contributing factor to missed nursing care is teamwork. Study results indicated that the level of nursing teamwork predicted the amount of missed nursing care (Kalisch 2009, Kalisch et al. 2012a, Kalisch et al. 2013b). Findings from a study (n=110 patient care units) comparing the top five units with the most missed care with the five units with the least missed nursing care uncovered the level of teamwork as the predominant difference in these units. The units with less missed nursing care had better teamwork (Kalisch et al. 2012a). Teamwork is an important part of the work environment in health care (Van Bogaert et al. 2014) and effective teamwork has positive outcomes for both staff and patients (Kalisch et al. 2007, Kalisch et al. 2013b). Lack of effective nursing teamwork is a serious matter as it threatens patient safety and quality care (Kalisch 2011).

Indications are that missed nursing care is of global concern, as the results of studies from other countries than the US also show that necessary nursing care is frequently missed in hospitals (Kalisch 2015). Studies on missed nursing care in Turkey (Kalisch et al. 2012b), Lebanon (Kalisch et al. 2013a), Brazil (Siqueira et al. 2013), and New Zealand (Winters & Neville 2012) indicate a comparable amount and type of missed nursing care and reasons for it in the US. When comparing MNC between 7 countries, Australia, Iceland, Italy, Korea, Lebanon, Turkey and the US, a significant difference was identified in overall MNC with Italy and the US reporting the most and Lebanon and Iceland the least MNC (Kalisch et al. 2015). The primary reason given for MNC across countries is related to inadequate staffing, a lack of material resources and communication/teamwork (Kalisch et al. 2015, Kalisch et al. 2011b). In Turkey and Lebanon material resources and communication were identified by nursing staff to be more of a reason for missed nursing care than did nurses in the other countries (Kalisch et al. 2015, Kalisch et al. 2013a, Kalisch et al. 2012b). In a study on care left undone carried out in 401 units in 46 general acute National Health Service hospitals in England, most nurses reported one or more nursing activities left undone due to lack of time during their last shift. The most frequently reported care left undone was comforting or talking to patients, patient education and developing or updating nursing care plans. Staffing levels, patient load, perceived work environment, quality of care and overall grading of patient safety were associated with care left undone (Ball et al. 2013). Comparable findings are seen in a study in Kuwait on factors contributing to nursing care not being completed as perceived by nurses in general hospitals. Comforting patients and family, adequate documentation and oral hygiene were the most frequently care activities missed (Al-Kandari & Thomas 2009). Study results from eight acute care hospitals in Switzerland indicate a

relationship between rationing of nursing care and nurse reported patient outcomes. With increased rationing a significant increase was seen in adverse patient outcomes, especially regarding nosocomial infections, pressure ulcers and patient satisfaction (Schubert et al. 2009).

International guiding bodies regarding health care and patient safety such as the World Health Organization and the Institute of Medicine, emphasize the importance of teamwork and the role of nurses in present and future patient care (World Health Organization 2009, Page et al. 2004, Sherwood & Barnsteiner 2012). This emphasis applies to health care services in every country in the world regardless of how their healthcare system is administered or who the buyer is. Indications are that health care in Iceland, one of the Nordic countries with nationalized healthcare is good as it ranks among the best in international comparisons on patient outcomes (OECD 2013, Pearse et al. 2012). These indicators however primarily focus on mortality and morbidity outcomes statistics and nursing sensitive outcomes are not identified. The growing international body of knowledge on the important contribution of nursing care in hospitals to patient safety and care quality (Aiken et al. 2011, Aiken et al. 2013, Kirwan et al. 2013) is assumed to also apply to Icelandic hospitals. However, little is known about patient safety, nursing care and nursing outcomes, and what contributes to the quality of nursing care, in acute care facilities in Iceland.

We were unable to find country wide studies which include all acute care hospitals in an entire country. This study includes the whole population of nurses working in acute care medical, surgical and intensive care units in Iceland. The objectives of this study were to identify the correlates of hospital, unit and staff characteristics, and nursing teamwork to missed nursing care in one nationalized health care system. The research questions are:

- 1) What hospital, unit and staff characteristics, including teamwork, are associated with missed nursing care?
- 2) To what extent do unit, staff characteristics and teamwork predict missed nursing care?

Conceptual framework

The conceptual framework of this study is based on the Missed Nursing Care Model derived from Kalisch and Lee (2010). The Model assumes that hospital, unit and staff characteristics

along with teamwork contribute to MNC in hospitals. The hospital characteristic studied was whether it was identified as a teaching hospital. Unit characteristics refer to whether they were medical units, surgical units, intensive care units or mixed medical and surgical units. Staff characteristics include gender, age, job title, number of hours worked per week, work hours, experience in role, experience on current unit, overtime, sick days, staffing adequacy, and number of patients taken care of on the last shift.

As in former studies on MNC and nursing teamwork, the conceptual framework of teamwork in this study is derived from Salas and colleagues (Kalisch & Lee 2010). Salas and colleagues (Salas et al. 2005) identified five core components of teamwork and three supporting coordinating mechanisms. The five core components are: team leadership, mutual performance monitoring, backup behavior, adaptability, and team orientation. The three coordinating mechanisms are shared mental models, closed-loop communication, and mutual trust, which are especially important in teams performing in stressful conditions. The Salas model has shown to apply well to nursing teamwork (Kalisch et al. 2009). A nursing team is defined as a group of nursing staff who works together towards a common goal of patient care in a given hospital acute care unit (Kalisch et al. 2010).

METHODS

This cross sectional study was carried out in all medical, surgical and intensive care units in Iceland, a total of 27 units in 8 hospitals. Seventeen units were in a 690-bed university hospital (9 medical, 6 surgical and 2 intensive care), 3 in a 133-bed teaching hospital (1 medical, 1 surgical, 1 intensive care unit), and 7 units in 6 smaller 8-68-bed regional hospitals (1 medical unit, 1 surgical unit, 5 medical and surgical units). Healthcare in Iceland is nationalized and all hospitals are governmental run.

The sample consisted of all (N=864) nursing staff providing direct patient care in the participating units. Response rate was 69.3%. Included in this study were all registered nurses (RNs) and practical nurses (PNs), which are the primary direct patient care providers in hospitals in Iceland (21 nurse managers and assistant managers and 10 other staff members either identified as nurse assistants or without an identified role, were excluded from the study reported in this paper). In Iceland, the majority of RNs have a baccalaureate degree in nursing and most PNs have a three-year vocational level education and are licensed health care

personnel. In Icelandic hospitals, PNs are defined as nursing assistive personnel working under the supervision of RNs.

Measures

Data were collected on background variables, missed nursing care and teamwork using a combined questionnaire of the MISSCARE Survey-Icelandic and the Nursing Teamwork Survey-Icelandic (NTS-Icelandic). The questionnaires were translated from US English to Icelandic using a rigid back-translation method and pilot-tested prior to the national study reported here. Both surveys, the MISSCARE Survey-Icelandic and the NTS-Icelandic, were tested for acceptability, reliability and validity (Bragadóttir et al. 2014, Bragadóttir et al. 2016). All items in the combined questionnaire are multiple choice questions except the one asking about number of patients cared for on the previous shift.

Characteristics of hospitals, units and staff

Hospitals were categorized into teaching hospitals (one university hospital and one teaching hospital) and other hospitals (six regional hospitals) and into: medical units (11), surgical units (8), intensive care units (3) and mixed medical and surgical units (5). The first part of the surveys asks about characteristics of staff. The staff characteristics variables used in this study were: gender, age, job title, number of hours worked per week, work hours, experience in role, experience on current unit, overtime, sick days, perceptions of staffing adequacy and number of patients taken care of during last shift.

The MISSCARE Survey-Icelandic

The MISSCARE Survey-Icelandic is a translation of the most recent US version of the survey published by Kalisch (2009). The MISSCARE Survey has two parts: Part-A asking about nursing care activities missed, and Part-B focusing on the reasons for omitting or delaying nursing care activities. For this study only Part-A was used. For Part-A which has 24 items, participants are asked to indicate how frequently on a 5-point Likert-type scale each element of nursing care is missed by the nursing staff on their unit by marking from (5) “always missed” to (1) “never missed”. Higher scores indicate more missed nursing care. The question on the frequency of MNC asks about MNC in general on the participants’ unit, by the nursing staff including the participant, and does not refer to a specific time period. Psychometric testing of the MISSCARE-Icelandic Part-A, indicated good acceptability with 78% of

participants answering all items. An overall test-retest measure in a pilot-study, based on data from 37 nursing staff members answering the questionnaire with a two-week interval, revealed Pearson's correlation coefficient of 0.782 ($p < 0.001$) for Part-A (Bragadóttir et al. 2014). Neither Cronbach's alpha reliability testing or factor analysis were appropriate for the testing of Part-A as it contains a list of nursing actions which are not necessarily related to one another (i.e. a nurse may not give a bath but may ambulate a patient) (Kalisch & Williams 2009).

The Nursing Teamwork Survey-Icelandic

The NTS-Icelandic is a translation of the US version of the Nursing Teamwork Survey (NTS) published by Kalisch, Lee and Salas (Kalisch et al. 2010). The survey has 33 items put forward as statements five subscales emerged from the data: 1) trust (7 items), 2) team orientation (9 items), 3) backup (6 items), 4) shared mental model (7 items), 5) team leadership (4 items). Participants are asked to mark on a 5-point Likert-type scale, to what extent each statement applies to their team. The five values on the scale are: (1) rarely, (2) 25% of the time, (3) 50% of the time, (4) 75% of the time, (5) always. Higher scores indicate better teamwork. Psychometric testing of the NTS-Icelandic indicated good acceptability with 80.8% of participants answering all items.

The test-retest intraclass correlation coefficient was based on data from 43 nursing staff members answering the questionnaire with a two-week interval. For the overall NTS-Icelandic the test-retest intraclass correlation coefficient was 0.693 (lower bound=0.498, upper bound=0.821) ($p < 0.001$), and for the five subscales it ranged from 0.55 to 0.712 ($p < 0.001$). Cronbach's alpha reliability coefficient for the overall teamwork was 0.911. For each of the subscales the Cronbach's alpha reliability coefficient was: 1) trust 0.814, 2) team orientation 0.763, 3) backup 0.750, 4) shared mental model 0.807, 5) team leadership 0.737. Confirmatory factor analysis indicated a good model fit for the five factors: trust, team orientation, backup, shared mental model, and team leadership (Bragadóttir et al. 2016).

Data collection

Data were collected in March-April 2012. In each unit there was a liaison person responsible for distributing the surveys to all nursing staff in their unit. Data collection material included the surveys, an information letter and a prepaid envelope. One and two weeks following the

data collection reminders were sent out via e-mail to nurse managers and the liaison persons who distributed the study to the nursing staff.

Data analysis

Data analysis was conducted by using IBM SPSS 22 (IBM, 2013). The unit of analysis for this study was the individual staff member. For MNC an overall mean score was calculated for each participant indicating the average amount of MNC. Only participants who spent most of their time on the unit were included in the analysis (n=527). For nursing teamwork an overall mean score for each participant was used to indicate the level of teamwork. A previous study using the NTS revealed that the overall teamwork score and the subscales were highly correlated contradicting using both the overall scale and the subscales as separate measures for regression analysis (Kalisch & Lee 2010). Due to covariance between hospital and unit, only the variable unit was used for the model testing. MNC and nursing teamwork were defined as continuous variables.

Preliminary data analysis included descriptive and bivariate analysis techniques. For identifying differences in MNC for hospital, unit and staff characteristics, t-test for independent groups or Analysis of Variance (ANOVA) was employed. Non parametric test, Mann Whitney, was conducted when the data did not meet the assumption for normal distribution. For identifying the relationship between nursing teamwork and MNC, the Pearson's correlation coefficient was utilized. Hierarchical regression analysis was calculated to explore the predictors of MNC. The categorical variables were recorded as dummy variables. Model 1 tested to what extent unit and staff characteristics predicted the variance in MNC and model 2 tested the extent to which nursing teamwork predicted the variance in MNC when controlling for unit and staff characteristics.

Ethical considerations

The study was approved by each hospital's Institutional Review Board or analogue body in the smaller hospitals, and the Data Protection Authorities of Iceland (S5388/2011) prior to data collection. Completing the survey equaled a written informed consent.

RESULTS

Participants were female (98.9%), RNs (62.6%) and PNs (37.4%), mainly working in teaching hospitals (79.5%). The majority were 35 years of age and older (72.0%), worked rotating shifts (85.4%), worked 30 hours or more per week (76%), and had 5 years or more experience in their role (71.7%). Most worked either in medical (34.5%) or surgical units (31.3%), and the vast majority had worked on their current unit for 5 years or more (55.4%). The majority had worked some overtime during the past three months (75.5%) and 70.9% perceived the staffing in their unit as adequate 75% or 100% of the time. Almost half of participants (47.3%) had been absent from work for 2 days (or shifts) or more during the past three months. On average participants took care of 6.39 (SD=3.20) patients on their last shift ranging from 1-20 patients. The majority (82%) took care of 8 patients or less. Hospital, unit and staff characteristics as well as mean scores for MNC are displayed in Table 1.

Hospital, unit and staff characteristics

As can be seen in Table 1, MNC was significantly related to several of the hospital, unit and staff characteristics variables tested in this study. Participants in teaching hospitals identified MNC significantly more than did participants from other hospitals ($t(525)=3.44$; $p<0.001$). A significant difference in MNC between unit types was also identified ($F(3, 523)=14.39$, $p<0.001$). A post-hoc test revealed that MNC was significantly lower in intensive care units than in medical ($p<0.001$) and surgical units ($p<0.001$). A difference in MNC was identified depending on the age of staff respondents ($F(3, 521)=5.92$, $p<0.001$). Participants in the age group of 34 years and younger reported more MNC than those in the age groups of 45-54 years ($p<0.01$) and 55 years and older ($p<0.01$). RNs reported significantly more MNC than did PNs ($t(525)=5.046$; $p<0.001$). A significant difference was identified between participants depending on their perceptions of adequate staffing on their unit ($F(3, 514)=6.099$, $p<0.001$). Those who perceived adequate staffing 100% of the time reported significantly less MNC than did those who perceived that staffing was adequate only 50% of the time ($p<0.01$) or 0% of the time ($p<0.01$). The number of patients taken care of on last shift turned out to have a weak but significant positive correlation ($r=0.099$, $n=491$, $p=0.029$) with mean MNC. The more patients the more MNC.

Predictors of missed nursing care

Significant variables were included in the multivariate analyses to determine the predictors of missed nursing care. For Model 1 the variables were: unit type, age, role and perceived adequate staffing. In Model 2 the overall nursing teamwork score was added to the analysis.

The following variables were coded as dummy variables: Unit (reference group = intensive care unit (ICU)), role (practical nurse = 0, registered nurse = 1), age (reference group = 34 years or younger), perceived adequacy of staffing (reference group = 100%).

The overall mean score for nursing teamwork was 3.87 (SD=0.47). A statistically significant relationship was identified between MNC and nursing teamwork using the overall mean scores for both variables with a Pearson's correlation coefficient of -0.436 ($p < 0.001$). The results of the hierarchical regression analyses are presented in Table 2. The test variables in the two models tested predicted in total 30% of the variance in MNC. The multiple regression testing of Model 1 indicated that unit type, role, age and staffing adequacy predicted 16% of the variance in missed nursing care ($F(9,37)=7.364$, $p < 0.001$). After entry of the nursing teamwork scale in Model 2, the total variance explained by the model as a whole was 30%, ($F(10,496)=20.831$, $p < 0.001$). The nursing teamwork scale explained an additional 14% of the variance in MNC after controlling for unit type, role, age and staffing adequacy.

The results of Model 1 show that unit is associated with MNC, expected MNC value is higher for nurses in medical and surgical units than for nurses in intensive care units when controlling for other variables in the model. Registered nurses are more likely to report MNC than practical nurses. After controlling for unit, role and age expected MNC value is higher for nurses who perceive adequate staffing 50% or less of the time compared to those who felt staffing was adequate 100% of the time. Those perceiving better staffing report less MNC. Teamwork was added to the model in step two. Expected MNC decreases with increased teamwork when the other variables were controlled in the model.

DISCUSSION

Study results show that in the Icelandic healthcare system, unit and staff characteristics and nursing teamwork contribute significantly to the variance in MNC as reported by direct care givers (RNs and PNs). Unit type, nurses' age and perceptions of staffing adequacy on their unit predict 16% of MNC. There were significantly more instances of MNC on medical and surgical units as opposed to intensive care units. There was also more MNC when staffing was reported to be inadequate half to most of the time. RNs and younger participants reported significantly more MNC than PNs and older respondents. Recent studies on nurses rating of patient safety and patient-centered care indicate age, experience and role to be a significant contributor to their perception. With higher age and more experience along with holding a managerial position was related to Korean nurses' perception of higher patient safety

competency (Hwang 2015). What exactly age, experience and role contribute to nurses' point-of view or perception, seems however complex, as another study shedding light on the orientation towards patient-centeredness of nursing students and nurses, indicated nursing students to have a more patient-centered orientation and the nurses a more professional-centered orientation (Grilo et al. 2014). These findings confirm that a point of view or perception is entirely within the eye of the beholder although influenced by such variables as age, experience, education and role.

Studies on MNC in the US including RNs and nursing assistants, showed a comparable finding in the relationship with job title or role as in our study, where perceived staffing adequacy and patient workload also contributed significantly to MNC (Kalisch et al. 2011a). However, in the US study also shift worked and absenteeism turned out to be significantly related to MNC which was not the case in the Icelandic sample. What explains these differences between the countries cannot be identified here, but it is noteworthy that in Iceland the majority of participants worked rotating eight hours shifts whereas in the US study most participants worked 12-hour day shifts (Kalisch et al. 2011a).

The higher reported level of MNC in teaching hospitals and in medical and surgical units is an important finding. The teaching hospitals in Iceland are the only tertiary health care centers in the country and they also have the highest student load. The findings point to a need to acknowledge this dual and unique role, and correct the misunderstanding that having students equals additional "hands" and thereby decreased workload for staff members. On the contrary, having to instruct students or new staff adds to the workload of nurses (Krichbaum et al. 2011).

The findings showing a significant difference in the perception of RNs and PNs in the amount of MNC are important. RNs identified significantly more MNC than did PNs. PNs work within the realm of what is RNs responsibility, both groups serving the purpose of providing necessary nursing care. However, each group is responsible for and carries out different nursing activities on a daily basis, RNs being primarily occupied with nursing assessment, diagnosis, nursing care planning and medication work, whereas the PNs are primarily carrying out basic nursing care including hygiene, nutrition and mobilizing patients. However, these results add to the findings of other studies that indicate variation in the extent of MNC depending on roles within the nursing staff population. Study findings from the US show that RNs report more overall MNC than do nursing assistants, and nurse leaders report more MNC

than do nursing staff (Kalisch 2009, Kalisch & Lee 2012a, Kalisch et al. 2011a). In a study in a US hospital where MNC activities were categorized into activities primarily carried out by nursing assistants (NAs), activities carried out by RNs and shared activities, findings indicated that RNs identified more MNC in activities carried out by NAs and shared activities, than did NAs. Regarding nursing activities generally carried out entirely by RNs, MNC was similar for RNs and NAs and in no case did NAs identify more MNC than did RNs (Kalisch 2009). These findings point to the need for studying further the variance in MNC in Iceland for each nursing activity depending on role, daily work and responsibility.

Overall nursing teamwork alone predicted 14% of MNC indicating a significant contribution. These results are in concordance with study results from US and Swiss hospitals, where teamwork was indicated to be a significant predictor of MNC (Kalisch & Lee 2010, Papastavrou et al. 2014). In the US study over 2000 nursing staff from 50 acute care hospital units were surveyed, and teamwork alone accounted for almost 11% of MNC (Kalisch & Lee 2010), slightly less than was the case in our study in Iceland. When studying the difference between units with high versus low MNC, Kalisch and colleagues (Kalisch et al. 2012a) identified that what differentiated these units was teamwork. In units with less MNC, teamwork was better.

This study has both strengths and limitations. Its primary strengths are that the entire population of Icelandic nurses working in inpatient medical, surgical and intensive care units, is included and that the response rate was almost 70%. Also, the use of reliable and valid questionnaires is a methodological strength, although the first time use of the recently translated survey for this population in Iceland could be limiting. However, the tools have demonstrated good psychometric properties (Bragadóttir et al. 2014, Bragadóttir et al. 2016). Participation for each unit varied but no control units were possible over any of the extraneous variables as all the eligible units in the country were included in the study.

Being able to include a total population in an entire health care system for a whole country is however considered the primary strength of this study, making it unique in many ways. Larger communities with diverse health care services may be somewhat complicated to study and analyse. Study findings from small homogenous communities such as the Icelandic one, contribute to the knowledge base of nursing worldwide and may be a significant step to understanding the larger context.

CONCLUSION

This study shows that MNC as illustrated in the MNC model, is found in Iceland as it is in other countries; this suggests that MNC is a global concern and exists across health care systems and countries. MNC varies between countries, indicating the importance of studying contributing factors in different settings and health care systems. In Iceland, the hospital and unit characteristics and participants age, role and perception of staffing adequacy as well as overall teamwork, contributed significantly to MNC. The single most contributing variable to MNC was teamwork. These study results call for an in-depth analysis of where and how teamwork needs to be improved in Icelandic hospitals.

No comparable former study has been conducted in Iceland. The message from this study is of importance to the larger world of healthcare providers, administrators and scholars, as well as the public. Missed nursing care is receiving increased attention (Jones et al. 2015), as scholars and health care providers are realizing how important evidence based practice is for staff and patient outcomes. The calling of this and comparable studies on MNC is that nursing care may need more respect and priority in today's healthcare system.

A recent account by a former hospitalized patient, Michael Ogg, who experienced missed nursing care, highlights the point he makes, that it is the low tech aspects of care that determine patient's outcomes in hospitals (Iezzoni & Ogg 2012). Michael Ogg, an English speaking, mentally alert, well-educated man with multiple sclerosis, was accompanied in the hospital with his advocate Lisa, a medically connected person. Despite his advantages, he experienced a number of incidents and errors during his 10 week stay in four facilities for treatment of a stage IV ischial pressure ulcer. As described by the authors it was the basic nursing care that went wrong, such as frequently missed meals, poor personal hygiene and poor bowel management (Iezzoni & Ogg 2012). An emphasis on these basic nursing activities is vitally important.

RELEVANCE TO CLINICAL PRACTICE

Although errors of commission have occupied most of the research and discussion about patient safety, equally, or perhaps even more critical are errors of omission. This study highlights the fact that this problem is extensive and some of the reasons for the problem. The impact of not providing care is reviewed in detail in a recent book entitled Errors of

Omission: How Missed Nursing Care Imperils Patients (Kalisch, 2015). It contains a review of research which explains the critical impact of not providing nursing care. By identifying the factors contributing to MNC in hospitals, appropriate interventions can be developed by clinicians and patient care administrators. Effective interventions should be aimed directly at important nursing care activities (Quinn et al. 2013) and at strengthening teamwork within units and groups (Kalisch et al. 2007, Kalisch et al. 2013b). The findings of this study point to the need to focus on medical and surgical units in teaching hospitals where staffing is inadequate and teamwork low.

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Table 1. Hospital, unit and staff characteristics, and overall mean scores (M) and standard deviations (SD) (scale range 1-5) for missed nursing care (MNC) (N=527)

Variables	MNC				
	n	%	M (SD)	Test statistic	Post hoc test
^aHospital					
1 Teaching hospitals	419	79.5	2.03 (.56)	3.44***	
2 Other hospitals	108	20.5	1.83 (.45)		
^bUnit					
1 Medical	182	34.5	2.14 (0.54)	14.39***	1>3***
2 Surgical	165	31.3	2.06 (0.55)		1>4***
3 Mixed medical-surgical	93	17.7	1.82 (0.44)		2>3***
4 Intensive care unit	87	16.5	1.76 (0.66)		2>4**
^cGender					
1 Female	519	98.9	1.99 (0.54)	651.5*	
2 Male	6	1.1	2.41 (0.27)		
^bAge					
1 Under 34 years	147	28	2.12 (0.46)	5.92***	1>3**
2 35-44 years	132	25.1	2.00 (0.46)		1>4***
3 45-54 years	153	29.1	1.92 (0.54)		
4 55 years or older	93	17.8	1.86 (0.67)		
^bRole					
1 Registered nurse	330	62.6	2.09 (0.48)	5.05***	

2 Practical nurse	197	37.4	1.84 (0.59)		
^bWork hours					
1 Days	30	5.7	1.92 (0.45)	.42	
2 Evenings	20	3.8	2.10 (0.76)		
3 Nights	27	5.1	1.96 (0.43)		
4 Rotating shifts	450	85.4	1.99 (0.54)		
^aHours worked per week					
1 Less than 30 hours	126	24.0	1.99 (0.55)	-.24	
2 30 hours or more	399	76.0	2.00 (0.58)		
^bHours of overtime in past 3 months					
1 None	126	24.5	1.88 (0.55)	2.90	
2 1-12 hours	235	45.5	2.00 (0.52)		
3 More than 12 hours	155	30.0	2.05 (0.54)		
^aDays or shifts absent in past 3 months					
1 None-1 day or shift	276	52.7	2,01 (0.56)	0.90	
2 or more days or shifts	248	47.3	1.97 (0.52)		
^bYears of experience in role					
1 Two years or less	69	13.3	2.09 (0.54)	1.98	
1 Greater than 2 years to 5 years	78	15	2.04 (0.48)		
2 Greater than 5 years to 10 years	98	18.9	2.04 (0.51)		
3 Greater than 10 years	274	52.8	1.94 (0.57)		
^bYears of experience on current unit					
1 Up to 6 months	26	5	2.05 (0.46)	.39	
2 Greater than 6 months to 2 years	92	17.7	2.02 (0.54)		
3 Greater than 2 years to 5 years	114	21.9	2.01 (0.55)		
4 Greater than 5 years to 10 years	110	21.1	2.00 (0.50)		
5 Greater than 10 years	179	34.3	1.96 (0.65)		
^bPerceived adequacy of staffing					
1 100% of the time	33	6.4	1.74 (0.47)	6.10***	3>1**
2 75% of the time	334	64.5	1.96 (0.54)		4>1**

3 50% of the time	116	22.4	2.11 (0.51)
4 25% or less of the time	35	6.7	2.17 (0.54)

^at-test for independent groups; ^bAnalysis of Variance (ANOVA) with Bonferroni post-hoc test; ^cMann Whitney, non-parametric test.

*p≤0.05; **p≤0.01, ***p≤0.001

Table 2. Hierarchical regression to determine predictors of MNC

Steps and predictors	Model 1				Model 2			
	B	Std. Error	β^a	t	B	Std. Error	β^a	t
Constant	1.44	0.14		10.42	3.37	0.05		15.11
1 Unit								
ICU (R)								
Medical	0.39	0.08	0.35	4.96***	0.28	0.06	0.26	4.90***
Surgical	0.32	0.08	0.28	4.00***	0.22	0.06	0.19	3.46**
Mixed	0.14	0.09	0.09	1.48	0.07	0.07	0.04	0.85
Role								
Practical Nurse (R)								
Registered nurse	0.22	0.07	0.19	3.31**	0.22	0.04	0.24	6.17***
Age								
34 years or younger (R)								
35 to 54 years	-0.05	0.07	0.04	-0.77	-0.10	0.05	-0.10	-2.11
55 years or older	-0.11	0.08	0.09	-1.72	-0.12	0.07	-0.08	-1.73
Perceived adequacy of staffing								
100% (R)								
75%	0.17	0.11	0.15	1.58	0.13	0.09	0.12	1.53
50%	0.27	0.12	0.21	2.26	0.18	0.09	0.14	1.91
0-25%	0.34	0.15	0.16	2.33	0.11	0.12	0.05	0.91

2	Teamwork		-0.45	0.05	-0.39	9.91***
	R ²	0.16	0.30			
	Adjusted R ²	0.14	0.28			
	F	7.37***	20.83***			

^a Standard coefficient

* p<0.05

** p>0.001

*** p<0.001