

“Leadership of frontline nurses working in University Medical Centers and the association with nurse reported quality of patient care: a cross-sectional study”

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ABSTRACT

Background: Frontline nurses need to show stronger leadership competencies to improve healthcare and accomplish change. Because of more dynamic and complex healthcare, nurses need to quickly and independently take more responsibility and accountability. Leadership competencies of nurses seems to be important to improve quality of care. A common leadership style is *transformational* leadership shortly defined as; building trust, encouraging others, innovative thinking and coaching others. Before improving quality, more insight in perceptions of nurses of delivered care is needed. Nurse reported quality of care (NRCQ) offers a reliable indication of quality of care.

Aims: To investigate leadership styles and practices of frontline nurses in Dutch University Medical Centers, the association with nurse reported quality of care and influencing factors of the association.

Method: A quantitative cross-sectional survey was conducted, among 3470 nurses working on various wards in five University Medical Centers. Leadership was measured with Multifactor Leadership Questionnaire (MLQ) and Leadership Practice Inventory (LPI). NRCQ was measured using a four-item instrument. To determine Influencing factors, nurse and ward characteristics were obtained.

Results: In total 655 nurses were included. Frontline nurses preferably use *transformational* leadership style ($M=44.6$, $SD=5.3$). On the LPI the highest leadership practices were found on “*enabling others to act*” ($M=7.6$, $SD=1,3$) and “*model the way*” ($M=7.1$, $SD=1,0$). A weak association was found between *transformational* leadership and NRQC (Pearson’s correlation $r=0.087$, $p=0.026$).

Conclusion and recommendation: Frontline nurses use transformational leadership style and practices during their daily work. However, finding show that there is room for development of leadership of frontline nurses and education is recommended. Leadership as well as quality of care appear to be complex concepts and further research is needed to understand different influencing factors between both concepts, to understand and improve nursing care.

Key words: Leadership, Nurses, Quality of Health Care, Academic Medical Centres

Leiderschap van verpleegkundigen werkzaam in UMC's en de associatie met verpleegkundig gerapporteerde kwaliteit van zorg

SAMENVATTING

Achtergrond: Verpleegkundig leiderschap is een belangrijk thema in de gezondheidszorg. De toenemende dynamiek en complexiteit van zorg vraagt verpleegkundigen, die direct aan bed staan, snel en onafhankelijk te schakelen en meer verantwoordelijkheid te nemen.

Sterke leiderschapscompetenties van verpleegkundigen zijn daarom nodig om kwaliteit van zorg te verbeteren. Eén van de bekendste leiderschapsstijlen is *transformationeel* leiderschap, kort te omschrijven als: bouwen aan vertrouwen, anderen aanmoedigen, innovatief denken en coaching. Voordat kwaliteit verbeterd kan worden, is inzicht in de mening van verpleegkundigen over de kwaliteit van zorg nodig. Deze mening is een betrouwbare indicatie van de verpleegkundige mening over kwaliteit van zorg (NRQC).

Doel: Het onderzoeken van leiderschap competenties van verpleegkundigen werkzaam in Nederlandse Universitaire Medische Centra, de associatie tussen leiderschap van verpleegkundigen en verpleegkundige mening over kwaliteit van zorg en de beïnvloedende factoren op de associatie.

Methode: Een eenmalige kwantitatieve observationele vragenlijst werd afgenomen, onder 3470 verpleegkundigen werkzaam in vijf Nederlandse Universitaire Medische Centra. Leiderschapsstijlen van verpleegkundigen werden gemeten met Multifactor Leadership Questionnaire (MLQ) en Leadership Practice Inventory (LPI). NRQC werd gemeten met een vier-item instrument.

Resultaten: In totaal werden 655 verpleegkundigen geïnccludeerd. Verpleegkundigen prefereren het gebruik van de *Transformationele* leiderschapsstijl, ($M=44.6$, $SD=5.3$). De hoogst ontwikkelde leiderschap competenties waren “*enabling others to act*” ($M=7.6$, $SD=1.3$) en “*model the way*” ($M=7.1$, $SD=1.0$). Een zwakke associatie was gevonden tussen *transformationeel* leiderschap en NRQC (Pearson's correlatie $r=0.087$, $p=0.026$).

Conclusie en aanbevelingen: Verpleegkundigen in de directe patiëntenzorg gebruiken *transformationeel* leiderschap in hun dagelijks werk. Het wordt aanbevolen om onderwijs te bieden aan verpleegkundigen om persoonlijk leiderschap verder te ontwikkelen. Leiderschap als kwaliteit van zorg blijken complexe concepten te zijn in deze studie. Meer onderzoek wordt aanbevolen om de verschillende verpleegkundige concepten te begrijpen, welke verbetering van zorg mogelijk kunnen maken.

Kernwoorden: Leiderschap, Verpleegkundigen, Kwaliteit van zorg, Universitair Medische Centra

INTRODUCTION

Worldwide health care providers have more technology and research findings available than ever before.¹ Due to increasing complexity and digitization, the worldwide healthcare system needs to change.¹ To accomplish change, leadership is needed in all parts of the health care system.² Frontline nurses, known as nurses working in daily care of patients,^{3,4} are the largest group of employees in the entire healthcare. Because of more dynamic and complex environments of healthcare, frontline nurses need to quickly and independently take more responsibility and accountability.⁵ University Medical Centers (UMC's) provide even more complex and innovative care to patients⁶, which may demand stronger leadership competencies of frontline nurses. Various international health care reports call for nurses to take leadership in the daily care of patients to improve quality of care.^{1,7-13} However, there is lack of information about the leadership styles and practices of frontline nurses.

Leadership can be defined as "Leadership is a process whereby an individual influences a group of individuals to achieve a common goal."¹⁴ The most common leadership styles are, transactional, laissez-faire and transformational leadership.¹⁵ Transactional leadership is described as "when a leader monitors deviations, mistakes and rewards achievements".^{15,16} Laissez-faire leadership style is when leaders avoid involvement.¹⁵ Transformational leadership style is when a leader is seen as charismatic leader who; builds trust, acts with integrity, encourages others, encourages innovative thinking and coaches and develops people.^{15,17} Kouzes and Posner describe transformational leadership in five leadership practices, defined as "skills and knowledge" of exemplary leaders, who: "model the way, inspire a shared vision, challenge the process, enable others to act and encourage the heart."¹⁸ Leadership of nurse managers have been widely studied.^{8,9,19-23} Managers particularly use transformational leadership style and studies show positive associations between transformational leadership and patient outcomes, improving quality of care.^{20,21,24-26}

Quality of care is defined by IoM as "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge."²⁷ Quality of patient care thereby focuses on the provision of patient care, which can be measured in terms of; patient satisfaction²⁸⁻³⁰, (adverse) patient outcomes^{9,31-34}, and patient safety.^{11,12} A frequently used measure of quality of patient care is nurse reported quality of care, which focuses on the quality of care as perceived by nurses.^{30,36-39} Nurse perceptions are developed over time through series of interactions and direct observations.³⁷ Thereby these perceptions are thought to be reliable measures of

quality of care.⁴⁰ It is thought that there could be an association between leadership of frontline nurses and quality of care.

Many factors may influence the association between leadership and quality of care.⁷ Research has shown that factors like years of working experience⁴⁰ and nurse education^{33,40} influence quality of patient care. Also research has shown factors like age²¹, years of working experience²¹, and educational level²³ influencing leadership. It is yet unknown which factors influence the association between leadership of nurses and quality of patient care.

AIMS

The primary aim of this study was to measure leadership styles and practices of frontline nurses working in Dutch University Medical Centers. The secondary aim was to investigate the association between leadership of nurses and nurse reported quality of patient care. The tertiary aim was to determine which potential factors influence the association between leadership of nurses and nurse reported quality of patient care.

METHODS

Design

This study had a quantitative, cross-sectional survey design to investigate a large group of the population at one point in time.⁴¹ Quantitative methods were used to investigate associations between the different variables.⁴¹ The study was conducted on various nursing wards in five UMC's between February and May 2018.

Population and Setting

The main population consisted of frontline nurses working on various wards of Dutch UMC's. In 2014, 17.730 nurses were working in the eight UMC's.⁶ Further specifications of nurses working in UMC's, like gender, age and experiences, were unknown. Thereby, non-probability sampling was used in the form of a convenience sample.⁴¹ To limit the risk of sampling bias⁴¹, five UMC's were approached to participate. This gave a more reliable insight of the population working in different provinces. Included were all frontline nurses, who were contracted on the participating wards.

Sample size

Sample size was calculated in line with association analysis⁴², using the theory of Green testing multiple correlation and individual predictors ($N = 50 + 8m$ in which m is the total used

independent variables).⁴³ Nine independent variables were used, explained later in data collection. Based on this a minimum sample of 130 participants ($N = (50 + 8 \cdot 9) = 122$) was needed for the sample. At the start of the study, one of the aims was to investigate the differences in leadership between UMC's calculated with one-way anova. Based on this aim sample size was calculated with an effect size of 0,5 and a power of 0.8, for a total of ten different groups (total groups of ward type) a sample size of 520 participants was needed for the sample.⁴⁴ In line with the literature a response rate of 22% was expected using emailed questionnaires in this population.^{41,45}

Data Collection

For this study an online survey was constructed, which included four different questionnaires about leadership styles, leadership practices, Nurse reported quality of care (NRQC) and questions on nurse and ward characteristics. To determine internal consistency of the questionnaires used in this particular study, Cronbach's Alpha was calculated as recommended by Tavakol et al.⁴⁶

Nurse and ward characteristics

Demographics of the frontline nurses were collected, in form of nurse and ward characteristics. The collected nurse characteristics were age, gender, highest educational level, function, weekly working hours, years of experience in nursing and years of experience in current specialty. Collected ward characteristics were the UMC and ward type where the nurse was employed. All different wards were divided in ten different categories, called ward type (*Table 3*). All collected nurse and ward characteristics were used to determine possible influencing factors.

Leadership

The primary aim focussed on leadership of nurses, which was measured in terms of leadership styles and leadership practices. Leadership styles were measured with the Multifactor Leadership Questionnaire (MLQ), originally developed by Bass and Avolio.^{15,16} Of the different forms of the MLQ, in this study the MLQ-6S was used, a short self-rate questionnaire measuring different components of *transformational*, *transactional* and *laissez-faire* leadership styles.^{16,47} The MLQ-6S showed high internal consistency of 0.88⁴⁷ and a Cronbach's Alpha of 0.86 in this study. The MLQ-6S was a 21-item questionnaire with a 5-point Likert-scale (1 indicating not at all, 5 indicating frequently, if not always), scores for the total MLQ ranging from 21 to 105 (highest). Component *transformational* leadership consists

of four subscales (idealized influence, inspirational motivation, intellectual stimulation and individualized consideration), the scores ranged between 12 and 60 (highest). Component *transactional* leadership consist of two subscales (contingent reward and management by exception). Component *laissez-faire* leadership consist of two subscales (management by exception and laissez-faire). Both *transactional* and *laissez-faire* scores range between 6 to 30 (highest).

Leadership practices were measured with the Leadership Practice Inventory (LPI), developed by Kouzes and Posner.^{18,48} The LPI originally has been used as a 360 degree instrument, with a self-rating and observer questionnaire. To measure personal leadership only the self-rating questionnaire was used. The LPI included 30 items, categorized into the five following leadership practices; “*modelling the way, inspiring a shared vision, challenging the process, enabling others to act and encouraging the heart*”.^{18,49} Each category included six items scored on a 10-point Likert scale, (1 indicating “almost never” to 10 indicating “almost always”), with scores per category ranging from 1 to 10 for the question mean, 6 to 60 (highest) for the total category mean and a total score ranging from 30 to 300 (highest). The LPI has been translated and validated in Dutch,⁵⁰ results showed Item Content Validity Index (I-CVI) of 1.0 (20 items) and 0.8 (10-items) and Scale Content Validity Index (S-CVI) of 92%.⁵⁰ A Cronbach’s Alpha of 0.94 was calculated in this study.

Nurse reported quality of care

To measure the association between leadership and quality of patient care, the parameter nurse reported quality of care (NRQC) was required. Measured with the four item questionnaire developed by Aiken et al. in 2002.³⁶ The first two items indicated *quality of care on their ward* each answered with a 4-point Likert scale (1 indicating poor, 4 indicating excellent). The third item referred to *the improvement of quality of patient care in their hospital over the past year* each answered with a 3-point Likert scale (1 indicating deteriorated, 3 indicating improved). The fourth item is an extra item which referred to the *confidence nurses felt about the ability of their patients to manage after hospital discharge* each answered with a 4-point Likert scale (1 indicating very confident, 4 indicating not at all confident).⁵¹ The total score of quality of care was calculated as the sum of the first three items and ranged from 3 to 11, higher score means excellent quality. Calculated Cronbach’s Alpha for these three items was 0.61, however it should be noted that this was reduced due to the short length of the questionnaire.⁴⁶ Thereby the reliability of the questionnaire could be interpreted as high.

Procedures

The MLQ, NRQC and NCRS were translated by medical experts of a certified translation agency, using the back-and-forward method.⁵² The survey was developed by researcher LH in an online digital survey application (DSA), LimeSurvey2003, version 2 (Hamburg, Germany).⁵³ Of all five approached UMC's in the Netherlands, both nursing councils and board of directors approved participation of the study. A contact person was appointed within each of the UMC's. Recruitment took place in participating wards of the UMC's. The online survey was tested by experts of each UMC.

After approval, nurses were approached by contact person or either through management layers by email. Participant information letter and link to the survey were attached in the invitation email. Consent was given by using the link starting the survey. Completing the survey took a maximum of thirty minutes in account. Participants were able to ask questions at any time by phone or email. After each 2 to 3 weeks a reminder was send to all approached nurses through email. The reminders again included participant information letter and link to the survey. Each participant received one invitation and two reminders. During the study close contact was kept with the contact persons. After ten weeks survey was closed and data was analysed by the research team.

Data Analysis

Descriptive statistics like percentages, means and standard deviations (SD) were calculated for all parameters. In the DSA participants could only return the survey after completing all questions which prevented the occurrence of missing data.

To identify association first a two-tailed correlation between leadership and NRQC was calculated. Pearson's correlation in case of normal distribution, Spearman's rho in case of non-normal distribution.⁵⁴ The statistical significant correlations determined the leadership variables used in linear regression. Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, multicollinearity and homoscedasticity. Univariate linear regression was used to determine the separate influencing factors of the dependent variable NRQC.⁵⁵ In case each association included a beta of $P < 0.20$, factors where included in multivariate analyses.⁵⁴ Multivariate analyses was used to calculate a total explained variances of the influencing factors of the association between leadership and NRQC.⁵⁴ Analysis was completed, using IBM SPSS Statistics, version 24 (Armonk, New York, USA).⁵⁶

Ethical Issues

This study was conducted according to the World Medical Association Declaration of Helsinki.⁵⁷ Privacy, dignity and health of all participants were protected. The survey contained no harmful nor burdensome questions. There were no direct benefits for participants. Participation was voluntary and participants could decide to leave the study at any time for any reason, without any consequences. Data were coded, reported and presented anonymous. As the study did not meet criteria for medical research, liability to the Medical Research Involving Human Subjects Act (WMO) was not applicable. The study protocol was presented to the Medical Research Ethics Committee of the UMC Utrecht for quality mandatory and approved, (UMCU-18-064/C).

RESULTS

Participants

A total of 3470 frontline nurses were approached. Of these 18,9% (N=655) frontline nurses, completed the survey (*Table 1*).

>Insert Table 1<

Nurse and ward characteristics

Of all nurses, 83.7% (N=548) were female with the average age of 40 years old and aged between 21 and 66. In total 11.3% nurses specified a birth date in 2018 and were categorized as age unknown. Of all nurses 40.6% (N=266) were senior nurse by function and 51.5% (N=337) followed a postgraduate nursing program as highest education (*Table 2*).

>Insert Table 2<

Participation per UMC ranged from 4.4% (N=29) to 41.5% (N=272). Ward type were divided in ten categories and ranged from 2.9% (N=19) for Mental health to 15.9% (N=104) for Paediatrics (*Table 3*).

>Insert Table 3<

Leadership

The MLQ showed nurses preferred to use *transformational* leadership style, mean 44.6 (SD 5.3). *Transactional* leadership style showed a lower use, mean 19.6 (SD 3.2). Nurses use of *laissez-faire* leadership showed to be lowest, mean 18.2 (SD 3.1). For the total MLQ, nurses scored a mean of 72.5 (SD 8.7) on the possible score range between 21 and 105 (*Table 4*).

The mean values of the LPI were mainly above two-third of the possible range between 1 to 10 for the categories “*Model the way*”, mean 7.1 (SD 1.0), “*Enabling others to act*”, mean 7.6

(SD 1.3) and “*encouraging the heart*”, mean 7.0 (SD 1.2). For the categories “*inspiring a shared vision*”, mean 6.2 (SD 1.5) and “*challenging the process*”, mean 6.3(SD 1.0), nurses scored between halfway and two-third of the possible range (Table 4).

>Insert Table 4<

Nurse reported quality of care

The NRQC was calculated for the first three items, mean 8 (SD 1). *Quality of care* in the UMC’s was scored as good to excellent by 82,7% (N=542) of the nurses and 17.3% (N=133) scored the *quality of care* in the UMC’s as fair to poor. A total of 35.4% (N=234) nurses were confident to very confident *about the ability of their patients to manage after hospital discharge* (Table 3).

Association between leadership and NRQC

A weak association was found between leadership and NRQC ($r=0.087$ to $r=0.129$). Significant results were shown for *transformational* leadership ($r=0.087$, $p=0.026$) and *laissez-faire* leadership ($r=0.079$, $p=0.044$)(Table 5). *Transformational* leadership and Quality of care of last shift (NRQC item 2) showed ($r=0.129$, $p=0.001$).

>Insert Table 5<

Influencing factors

Simple linear regression was calculated to predict NRQC based on separate association with nurse and ward characteristics. The independent variables age and experience in this specialty were excluded because of multicollinearity with experience of nurses. Parameters with a Beta P value <0.20 were gender ($r=0.137$, $p=0.002$), experience ($r=0.084$, $p=0.032$), function ($r=0.153$, $p=0.004$), ward type ($r=0.153$, $p=0.079$). The last two variables were divided in more than 5 groups, and showed only a slight difference between means of NRQC (Table 6). Because of this the variables function and ward type where excluded as influencing factors.

>Insert Table 6<

To determine influencing factors and variance in NRQC, multiple regression was used to assess the ability of influencing factors leadership, gender and experience, to predict NRQC. To prevent multicollinearity, *transformational* leadership was chosen to indicate

leadership. Of the total variance in NRQC 3%, ($F=(3, 651)=6.472, p<0.001$) was explained by the model as a whole (*appendix 1*).

DISCUSSION

The findings showed frontline nurses working on different wards of UMC's use preferably transformational leadership style and practices, the mean scores show a moderate development of *transformational* leadership. Frontline nurses score highest for the leadership practices "*Enabling others to act*", "*Model the way*", and "*Encouraging the heart*", scoring between 7.0 and 7.6 of the possible range between 1 to 10. The findings also showed that frontline nurses use *transactional* and *laissez-faire* leadership styles less compared to *transformational* leadership. A weak association was found between NRQC and *transformational* leadership of frontline nurses. Influencing factors on the association between leadership of frontline nurses and NRQC showed to be gender and experience as a nurse. Although a weak association was found, the findings were significant ($p<0.001$) and explained a total of 3% variance.

Our findings showed frontline nurses had developed a moderate level of transformational leadership, measured with LPI and MLQ. Although no other studies identified transformational leadership of frontline nurses with the MLQ, scores could be compared with the normative sample of the MLQ by Bass and Avolio.¹⁶ The normative sample exists of managers of different professional backgrounds. Frontline nurses scored a little lower, with a mean of 0.3 point per question, compared to the normative sample. This little difference could be explained by differences in tasks and positions. The transformational leadership practices of frontline nurses, measured with the LPI, can be compared with other studies. Prominent similarity with the study of Fardellone and colleagues⁴ was the highest average response in the different categories. With highest score for "enabling others to act", a practice which frontline nurses prefer to use helping patients and colleagues to develop.^{4,48} The least developed practice was "inspiring a shared vision", which enables to imagine the future and sharing possibilities.^{4,48} However, compared to our study the leadership practices of frontline nurses in the study of Fardellone and colleagues showed to be higher developed.⁴ Eighty-six percent of the participants had a bachelor or higher, which could explain the differences in development. Also the study of Boamah showed leadership practices of frontline nurses as extremely high.⁵⁸ However, unexpected was the difference in highest educational level of frontline nurses, in our study 20.2% had a college nursing diploma, verses 47.1% in Boamah's study.⁵⁸ Transactional and *laissez-faire* leadership showed to be used less than transformational leadership by frontline nurses. This is a

positive finding, because both leadership styles are mostly passive styles and do not contribute to the work of nurses.

A unique contribution of this study is the association of *transformational* leadership of frontline nurses with Nurse Reported Quality of Care. Although the reported quality of care was higher than found in other studies,^{30,37,38,59} the found statistical significant association was weak. Wong and colleagues showed a weak association between NRQC and trust in managers, work engagement and authentic leadership of the nurse manager.⁵⁹ This and other studies^{30,38,59} showed different weak associations between NRQC and other variables in nursing care. Which entails that NRQC is a complex variable with different associations and can partly explain the total 3% variance explained by leadership, gender and years of experience as a nurse, found in our study.

Some limitations, however need to be highlighted. First, the exact participation rate was unknown. This was due to the differences in approaching for each UMC. In three of the five UMC's the contact persons emailed the division managers, followed by emailing the middle managers, who finally emailed the nurses. This could have caused delay or even resulted in not receiving an invitation. It is also known that nurses less frequently check their email than administrative employees. Which could have resulted in missing the invitation for the survey. Also, during data collection, frontline nurses addressed a heavy workload and time for patient care is precious to nurses. Further research should find other ways to collect data of frontline nurses, using for instance QR-codes instead of email or different methods than surveys. Second, response bias could have been an issue, the response-rate of 18,9% could indicate that only participants interested in leadership completed the survey. However, at the end of the survey there was the possibility to leave a note, and of these around 33% addressed "leadership is a hype and nonsense". This also indicates that frontline nurses think differently about leadership and quality of care. It is recommended to conduct qualitative research to investigate experiences and believes of leadership of frontline nurses. Another limitation to address, is the complexity of NRQC as well as leadership, what makes measuring the associations between both concepts too complex to fit in one single questionnaire. More empirical research is needed to explain all associations between the different concepts in nursing to improve nursing care of patients as well as for nurses.

A strength of this study was the use of validated and reliable instruments, all were translated back and forward and had a high Cronbach's alfa. Another strength was the participation of five UMC's, together with the reached sample size. This increases generalisability of the study, for UMC's in the Netherlands. Also, to our knowledge the LPI and MLQ have never

been combined in one study, combining both instruments gave more insight in the leadership of nurses. However, the complexity of leadership is difficult to measure and the question is if the LPI and MLQ, even together, do measure the personal leadership of frontline nurses. Development of a reliable and validated instrument to measure personal leadership of nurses is recommended. An instrument that can be used to measure development over time and is able to measure differences of leadership development.

The last years in the Netherlands various leadership programs started. However, these programs focussed mainly on nurse leaders as nurse managers, post-doctoral nurses and community care nurses. Although, it is globally reckoned that leadership of frontline nurses is necessary to improve healthcare,^{1,7-12,60} leadership of frontline nurses in UMC's is underexposed. Our study showed that transformational leadership of frontline nurses can be more developed. It would be expected that leadership competencies of frontline nurses in UMC's is more developed than that of frontline nurses in general hospitals, because of more complex and dynamic care in these settings. Thereby, leadership programs are needed for frontline nurses and transformational leadership should also be taught in basic education of nurses, from day one of their studies.

However, education alone is not the answer. Management should stimulate and motivate frontline nurses to use their leadership competencies. Our study showed that the practices "inspiring a shared vision" and "challenge the process" are the less developed practices frontline nurses use. Management can stimulate the development by challenging frontline nurses to be more assertive and stand up for their ideas and share this inspiration with their colleagues. This will improve health care and the direct patient care.

Conclusion

This study shows that frontline nurses use transformational leadership style and practices during their daily work. However, findings show that there is room for development of leadership of frontline nurses. A weak association is shown between leadership of frontline nurses and nurse reported quality of care explaining, together with gender and years of experience as a nurse, a total variance of 3%. However, leadership as well as quality of care are complex concepts and further research is needed to understand both concepts in nursing and the association with different factors. Suggesting education of frontline nurses to develop leadership and combining education with practical solutions as stimulation and motivation of managers. Combined with research to investigate leadership of frontline nurses during this development and measure the differences in quality of care.

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FIGURES AND TABLES

Table 1 Response per University Medical Centre

	Approximated	Response	Response-rate
UMC 1	2000	272	13,6%
UMC 2	±600	123	20,5%
UMC 3	±645	171	26,5%
UMC 4	45	29	64,4%
UMC 5	±180	60	33,3%
Total	3470	655	18,9%

Table 2 Nurse Characteristics

		N=	N %
Total Participation	Nurses	655	(100%)
Gender	Female	548	(83.7%)
Age in Years	<i>Mean age (SD)</i>	40.5	(12.0)
	<25-34	236	(36.0%)
	35-54	247	(37.7%)
	55-65>	97	(14.8%)
	Unknown	75	(11.5%)
Highest Educational Level	College Nursing Diploma ^a	132	(20.2%)
	Bachelor Degree in Nursing	140	(21.4%)
	Postgraduate Nursing program ^b	337	(51.5%)
	Master Degree in Nursing or higher ^c	46	(7.0%)
Function	Nurse	206	(31.5%)
	Senior Nurse	266	(40.6%)
	Specialised Nurse	122	(18.6%)
	Nurse Specialist/Practitioner	19	(2.9%)
	Team Leader/Manager	42	(6.4%)
Experience as a Nurse	<i>Mean years (SD)</i>	17.1	(11.6)
	(<1-9)	219	(33.5%)
	(10-19)	175	(26.7%)
	(20>)	261	(39.8%)
Experience in this Specialty	<i>Mean years(SD)</i>	10.6	(9.1)
	(<1-9)	377	(57.6%)
	(10-19)	179	(27.3%)
	(20>)	99	(15.1%)
Weekly Working Hours	<i>Mean hours per week (SD)</i>	29,4	(5.7)
	Parttime (0-35)	526	(80.3%)
	Fulltime (36>)	129	(19.7%)

a. of these in-service and vocational education are included

b. of these Nurse specialisations and post bachelor education (e.g. research nurse education) are included

c. of these university education and master of bachelor education (e.g. nurse practitioner and nurse specialist) are included

Table 3 Ward Characteristics

		N=	N %
Total Participation	Nurses	655	(100%)
University Medical Center	UMC1	272	(41.5%)
	UMC2	123	(18.8%)
	UMC3	171	(26.1%)
	UMC4	29	(4.4%)
	UMC5	60	(9.2%)
Ward type	Acute Care for women ^a	55	(8.4%)
	Cardiothoracic ^b	56	(8.5%)
	Surgery ^c	82	(12.5%)
	Intensive Acute Care ^d	96	(14.7%)
	Intern Medicine ^e	69	(10.5%)
	Neurology & Neurosurgery	54	(8.2%)
	Oncology ^f	94	(14.4%)
	Paediatrics ^g	104	(15.9%)
	Outpatient-clinics ^h	26	(4.0%)
	Mental Health ⁱ	19	(2.9%)
Nurse reported quality of Care (NRQC, items 1-3, range 3-11)	<i>Mean Total 3-items (SD)</i>	8	(1)
	Good to Excellent	542	(82.7%)
	Fair to Poor	133	(17.3%)
Quality of care on last shift (NRQC item1)	Good to Excellent	575	(87.8%)
	Fair to Poor	80	(12.2%)
Quality of care on Unit (NRCQ item 2)	Good to Excellent	509	(77.8%)
	Fair to Poor	146	(22.2%)
Quality Hospital over the last year (NRCQ item3)	Improved	133	(20.3%)
	Remained the same	305	(46.6%)
	Deteriorated	217	(33.1%)
Confidence patients can manage own care	Confident to very confident	234	(35.7%)
	Somewhat confident to not confident	421	(64.3%)

a. including gynaecology and obstetrics

b. including CCU, MC Cardio, Thorax, lung

c. including all surgery wards except for oncology and neurosurgery

d. including ICU, traumatology, operation room, high care and medium care

e. including rheumatology, rehabilitation, internal medicine

f. including all oncology wards, surgery and non-surgery

g. including intern medicine, NICU, PICU, high care, medium care and other paediatrics

h. including all out clinical patient care

i. including all psychiatric care for adults, young adults and children

Table 4 Leadership of Nurses

Leadership	Questionnaire	Scale Range	Mean ^a	SD	Mean Question ^b
Transformational Leadership	MLQ	12 - 60	44.6	5.3	3.7
Transactional Leadership	MLQ	6 - 30	19.6	3.2	3.2
Laissez-Faire Leadership	MLQ	6 - 30	18.2	3.1	3.0
Total Scale Score	MLQ	21 - 105	72.8	8.7	3.5
Model the way	LPI	6 - 60	42.7	6.5	7.1
Inspiring a shared vision	LPI	6 - 60	37.4	9.2	6.2
Challenging the proces	LPI	6 - 60	37.5	8.4	6.3
Enabling others to act	LPI	6 - 60	45.5	5.3	7.6
Encouraging the heart	LPI	6 - 60	42.2	7.1	7.0
Total scale score	LPI	30 - 300	205.32	32.2	6.8

Different ways of reporting outcomes of the means are possible, to make comparison possible with other studies, both possible means are reported in this study:

- a. Means per component are shown
- b. Means per question of the different components

Table 5 Correlations between leadership and nurse reported quality of care

	Questionnaire	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Transformational Leadership	MLQ	1														
2. Transactional Leadership	MLQ	.687***	1													
3. Laissez-Faire Leadership	MLQ	.348***	.707***	1												
4. Total Scale	MLQ	.911***	.886***	.675***	1											
5. Model the way	LPI	.575***	.528***	.239***	.568***	1										
6. Inspiring a shared vision	LPI	.613***	.540***	.198***	.589***	.745***	1									
7. Challenging the process	LPI	.576***	.493***	.157***	.539***	.696***	.847***	1								
8. Enabling others to act	LPI	.565***	.484***	.217***	.538***	.624***	.632***	.645***	1							
9. Encouraging the heart	LPI	.613***	.557***	.222***	.599***	.689***	.748***	.703***	.736***	1						
10. Total Score	LPI	.671***	.592***	.231***	.645***	.852***	.927***	.906***	.802***	.879***	1					
11. Nurse Reported Quality of Care	NRQC	.087*	.049	.079*	.085*	-.025	-.017	-.023	.019	.022	-.008	1				
12. Quality of care last shift	NRCQ	.129***	.065	.072	.111**	.032	.005	-.019	.047	.050	.022	.714***	1			
13. Quality of care on unit	NRCQ	.067	.037	.061	.071	-.026	-.046	-.047	.021	.003	-.027	.778***	.480***	1		
14. Quality of care hospital	NRCQ	.019	.017	.050	.026	-.051	-.001	-.005	.015	.002	-.011	.776***	.251***	.365***	1	
15. Confidence patients can manage own care	NRCQ	.040	.069	.081*	.067	-.003	-.024	.022	.016	.025	.020	.173***	.108**	.074*	.190***	1

N=655, Range = possible range of factor score, SD=Standard Deviation

*. Correlation is significant ($p < 0.05$ level (2-tailed)).

**. Correlation is significant ($p \leq 0.01$ level (2-tailed)).

***. Correlation is significant ($p \leq 0.001$ level (2-tailed)).

Table 6 Influencing Nurse and Ward characteristics on the scores of Nurse Reported Quality of Care

Factors		Mean of NRQC	SD	N=	R	R ²	Beta	p-value	F	p-value F-change
Age in Years		7.72	1.37	580	.122	.013	.014	.003	8.787	.003
Experience as a Nurse		7.70	1.35	655	.084	.006	.010	.032	4.624	.032
Experience in this Specialty		7.70	1.35	655	.070	.005	.010	.074	3.193	.074
Weekly working hours		7.70	1.35	655	.023	.001	.006	.554	.351	.554
Gender	Female ^R	7.62	1.34	548	.137	.019	7.123	< .001	12.471	< .001
	Male	8.12	1.35	107			.499	< .001		
Highest Educational Level	College Nursing Diploma ^R	7.70	1.23	132	.056	.003	7.742	<.001	.693	.557
	Bachelor Degree in Nursing	7.59	1.29	140			-.157	.339		
	Postgraduate Nursing program	7.81	1.39	337			-.030	.827		
	Master Degree in Nursing or higher	7.83	1.39	46			.149	.520		
Function	Nurse ^R	7.72	1.37	206	.153	.023	7.723	<0.001	3.872	.004
	Senior Nurse	7.56	1.27	266			-.167	.179		
	Specialised Nurse	7.70	1.46	122			-.018	.904		
	Nurse Specialist/Practitioner	8.53	1.71	19			.803	.013		
	Team Leader/Manager	8.17	0.99	42			.443	.051		
University Medical Center	UMC1 ^R	7.64	1.44	272	.064	.004	7.643	.001	.674	.610
	UMC2	7.82	1.42	123			.178	.226		
	UMC3	7.67	1.17	171			.023	.860		
	UMC4	7.97	1.05	29			.322	.223		
	UMC5	7.72	1.39	60			.073	.704		
Ward type	Acute Care for women ^R	7.42	1.34	55	.153	.024	7.418	<.001	1.729	.079
	Cardiothoracic	7.52	1.50	56			.100			

Surgery	7.78	1.31	82			.362	.696		
Intensive Acute Care	7.66	1.34	96			.238	.122		
Intern Medicine	7.87	1.16	69			.451	.063		
Neurology & Neurosurgery	7.35	1.23	54			-.066	.797		
Oncology	7.68	1.30	94			.263	.250		
Paediatrics	7.85	1.41	104			.428	.056		
Outpatient-clinics	8.31	1.67	26			.890	.006		
Mental Health	7.89	1.29	19			.477	.183		

SD = Standard deviation

R = reference group

Beta= unstandardized coefficient

Appendix 1

Multiple Regression influencing factors on the association of leadership and NRQC

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change
						F Change	df1	df2	
1	,170 ^a	,029	,024	1,333	,029	6,472	3	651	,000

a. Predictors: (Constant), gender 0= Female, 1= Male, Transformational Leadership, Experience as a Nurse (in years)

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	34,478	3	11,493	6,472	,000 ^b
	Residual	1156,063	651	1,776		
	Total	1190,540	654			

a. Dependent Variable: Total Quality of Care, 3(poor)-11(excellent)

b. Predictors: (Constant), gender 0= Female, 1= Male, Transformational Leadership, Experience as a Nurse (in years)

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6,704	,434		15,463	,000
	Transformational Leadership	,018	,010	,072	1,839	,066
	Experience as a Nurse (in years)	,007	,005	,061	1,566	,118
	gender 0= Female, 1= Male	,467	,141	,128	3,303	,001

a. Dependent Variable: Total Quality of Care, 3(poor)-11(excellent)