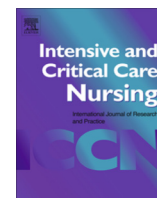




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Communication satisfaction and job satisfaction among critical care nurses and their impact on burnout and intention to leave: A questionnaire study

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ABSTRACT

Objectives: To investigate the relationship between communication and job satisfaction and their association with intention to leave and burnout among intensive care unit nurses.

Research methodology/design: A multicentre questionnaire study.

Setting/participants: Intensive care nurses (n = 303) from three Flemish hospitals.

Main outcome measures: Communication satisfaction assessed by the Communication Satisfaction Questionnaire, intention to leave through the Turnover Intention Scale (from the Questionnaire for the Perception and Assessment of Labour) and burnout by the Maslach Burnout Inventory. Job satisfaction was measured by a visual analogue scale.

Results: Average job satisfaction was $7.66 \pm 1.34/10$. Nurses were most satisfied about 'Communication with supervisor' (68.46%), and most dissatisfied about 'Organisational perspectives' (34.12%). Turnover intention was low among 49.5% (150/290) and high among 6.6% (20/290). Three percent (9/299) of intensive care nurses were at risk for burnout. All dimensions of communication satisfaction were moderately associated with job satisfaction, intention to leave and burnout.

Conclusion: This study demonstrated high levels of communication and job satisfaction in a sample of nurses in Flanders. Intention to leave and burnout prevalence were low. To a certain extent, communication satisfaction might be associated with job satisfaction, intention to leave and burnout.

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Implications for Clinical Practice

- Job satisfaction can easily and quickly be measured by means of a visual analogue scale. We advise to monitor and measure it periodically among nurses, as this is associated with health outcomes of hospitalised patients.
- As communication satisfaction is moderately but significantly associated with job satisfaction, intention to leave and burnout among intensive care nurses, it is worthwhile for the management of the department to invest in and to optimise their internal communication.
- The communication satisfaction questionnaire provides a tool for the management to prioritise the dimensions of internal communication which are most related to job satisfaction, intention to leave and burnout among intensive care nurses or which have the most potential to improve.
- Overall, there is room for improvement regarding communication satisfaction among intensive care nurses. The intensive care unit is part of a bigger organisation, the hospital, which should invest in a hospital-wide communication plan or procedure. Current internal communication processes should be improved and similar strategies can be used for the different departments.

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Introduction

Nurses fulfill an essential role within the intensive care unit (ICU) team. They contribute to improved clinical outcomes, fewer complications as well as errors and hence to reduced morbidity and mortality. ICU nurses co-operate closely with physicians as well as with colleagues and interact with the family of the patient (Blot et al., 2011, 2014; Brock et al., 2013; Coburn and Gage-Croll, 2011; Courtenay et al., 2013; Liu et al., 2015). These collaborations can lead to ethical conflicts, in particular when nurses feel insufficiently involved in medical decisions (Falco-Pegueroles et al., 2016).

ICU nurses have unique working conditions, characterised by a high technical environment and the continuous handling of seriously ill patients requiring highly specialised training and education (Endacott et al., 2015). In this regard, the ICU differs from many other departments (Cartledge, 2001; van Dam et al., 2013).

The specific working conditions of ICU nurses render them vulnerable for burnout. Similar to nurses in other departments, night shifts, work-related stress, the number of days off, conflicts with colleagues or patients, the relationship with their supervisors and the organisation influence the risk on burnout among ICU nurses. For nursing staff, poorly organised services are associated with higher stress levels. Stress triggers burnout, moderated by the way nurses cope with stressors (Cartledge, 2001; Embriaco et al., 2007; Ntantana et al., 2017; Ramirez et al., 1996; Vifladdt et al., 2016). Besides overall stress, anxiety and depressive symptoms seems to play a role as well. In a survey among 370 ICU nurses and 121 general ward nurses, Mealer et al. (2007) found anxiety and depressive symptoms to be common in both groups. ICU nurses, however, had an increased prevalence of post-traumatic stress disorder (PTSD) symptoms as compared with general ward nurses (Mealer et al., 2007).

The experience of stress has been repeatedly demonstrated as a major determinant for burnout (Embriaco et al., 2007; McHugh et al., 2011). Burnout has a negative impact on mental health, especially when resilience is low (Arrogante and Aparicio-Zaldivar, 2017). Burnout reduces the quality of ICU team communication, leading to lower quality of care (Galletta et al., 2016). In addition, staff rotation and absenteeism become significantly more common inflicting higher costs to health care organisations (Cartledge, 2001; Embriaco et al., 2007).

Besides the risk for burnout, stress and poor job satisfaction also contribute to increased turnover intention among ICU nurses. Factors associated with the intention to leave the ICU include high workload, stress-related health problems and night shifts (Cartledge, 2001; Courtenay et al., 2013; Embriaco et al., 2007; van Dam et al., 2013). The issues of burnout, absenteeism and turnover intention also have important socio-economic consequences as it threatens the availability of ICU nurses (Dessy, 2009; Embriaco et al., 2007).

The key issue in these challenges is job satisfaction. High levels of job satisfaction are associated with lower intention to leave, burnout, and absenteeism among health care staff (Castle et al., 2007; Gardulf et al., 2008). An increasing number of studies have also found associations between job satisfaction and patient outcomes in ICUs (Boev et al., 2015).

Job satisfaction is associated with nurse autonomy and the availability of sufficient technical skills to meet the required level of care (Cartledge, 2001, van Dam et al., 2013). Also, communication appears to have a link with job satisfaction among nurses (Gardulf et al., 2008; Hayes et al., 2010). This is not surprising, since internal communication influences the employees' performance, satisfaction and involvement, which in turn, are among the key success factors of an organisation (Hamilton,

1987). Contrary to what many think, everyone in the organisation actively participates to the continuous process of internal communication. Indeed, internal communication is more than informing or deploying resources to transmit messages. It includes all interaction in an organization where meaning arises (van Ravenstein and Reijnders, 2014). It remains, however, uncertain to which extent satisfaction about internal communication is related with the overall job satisfaction on one hand and burnout and turnover intention on the other hand. The objective of this study is to explore these particular relationships among ICU nurses.

Methods

Objective

The aim of this quantitative questionnaire study is to assess the relationship between communication and job satisfaction and their association with burnout and intention to leave among ICU nurses in Flemish hospitals.

Setting and participants

ICU nurses were invited to participate to a multicentre questionnaire study. Three Flemish hospitals took part: one university hospital and two general hospitals.

The main investigator contacted the heads of the nursing departments of the three hospitals. They informed the head nurses of the ICU departments and motivated them to support the study. The head nurses informed the ICU nurses by mail in January 2015. Questionnaires were distributed and completed between February 1, 2015 and March 15, 2015. Participation in the study was on voluntary basis (voluntary response sampling). The study on ICU nurses was part of a larger questionnaire survey among hospital nurses (Vermeir et al., 2017).

Ethical approval

The study was approved by the ethics committee at Ghent University Hospital (Central Ethics Committee, EC No. 2015/0052) and by the local ethics committees of the two other hospitals. All potential respondents were informed about this study through a newsletter.

Data collection

Data were collected through three instruments: the Communication Satisfaction Questionnaire (CSQ) (Downs and Hazen, 1977), the Turnover Intention Scale (from the Questionnaire for the Perception and Assessment of Labor (van Veldhoven and Meijman, 1994) and the Maslach Burnout Inventory (MBI) (Maslach et al., 1996). Job satisfaction was assessed by a visual analogue scale (VAS-scale) ranging from 0 (very poor) to 10 (excellent). A score of ≤ 5 was considered to reflect "dissatisfaction".

The CSQ consists of eight dimensions, each consisting of five items with Likert scale score of 1 (very dissatisfied) to 7 (very satisfied). Scores on the dimensions can range from 5 to 35. The eight dimensions included in the CSQ questionnaire are reported in Table 1 (Downs and Hazen, 1977).

The CSQ was submitted to a panel of experts consisting of nurse managers (n = 4), communication experts (n = 4), care managers (n = 6) and head nurses (n = 6), who adapted this questionnaire to the healthcare setting. The questionnaire was pilot-tested by 15 randomly selected nurses, resulting in minimal adjustments. The expert panel approved the final adaptations. This study was part of a larger study, in which an exploratory factor analysis

Table 1
Dimensions of the CSQ.

GOP	General Organizational Perspective	questions the satisfaction of employees concerning general information about the organisation, its goals and achievements. It also inquires on knowledge of employees about external events such as a new public policy impacting the organisation
OI	Organisational Integration	assesses satisfaction with the extent to which employees receive information about their immediate environment. This dimension includes questions on awareness of what is happening in the organisation, what departments are doing and news about the staff
PF	Personal Feedback	raises questions about the knowledge of job-related problems among managers. In addition, it assesses whether the employees know how they are assessed and evaluated
RSup	Relationship to Superiors	questions the components of the bottom-up and top-down communication within the organisation. This dimension assesses the openness of superiors towards employees as well as their ability to listen. Two of the five items assess the confidence of the employee in the manager
HIC	Horizontal and Informal Communication	questions the intensity of communication and the accuracy of the information acquired by networking
MQ	Media Quality	assesses satisfaction of the various communication resources such as meetings and written communication. In addition, the amount of communication within the organisation is examined
CC	Communication climate	is one of the strongest dimensions because it represents what people spontaneously think when hearing 'communication satisfaction'. Questions within this dimension gauge the communication at the individual as well as at the organisational level. As such, it can be determined whether the communication encourages the identification of the employee and whether this is a motivating and stimulating factor within the organization. The extent to which the employees are good communicators is investigated as well as the extent to which the information helps advancing the work
REmp	Relationship with Employees	is confined to managers and examines the openness of employees towards top-down communication and their readiness to implement bottom-up communication. The manager's overload of communication is also assessed

confirmed the multi-dimensional structure of the translated CSQ's individual-level variables with reliable scales for the eight dimensions (Cronbach's alpha values varied from 0.761 to 0.942) (Vermeir et al., 2018).

The Turnover Intention Scale consists of four yes–no questions. Turnover intention is considered low (0–1 affirmative items), moderate (2 affirmative items) or high (3–4 affirmative items) (van Veldhoven and Meijman, 1994).

The Maslach Burnout Inventory measures three aspects of burnout syndrome: emotional exhaustion (9 items), depersonalisation ('cynicism', 5 items) and personal accomplishment ('competence', 8 items) and uses Likert scales from 0 (never) to 6 (always). Their ranges are 0–45, 0–25 and 0–40, respectively. High scores on emotional exhaustion (>20) and depersonalisation (>10), and low scores on personal accomplishment (<25) are indicative for burnout (Maslach et al., 1996).

Data analysis

Analyses were performed using the statistical program SPSS (version 22.0). Descriptive analyses are reported by numbers and percentages, means and standard deviations. Normality was explored through Kolmogorov-Smirnov and Shapiro-Wilk tests. None of the continuous variables was normally distributed. Spearman correlations were calculated and interpreted as follows: $[\rho] < 0.3$ is weak, $[\rho] = 0.3–0.5$ is moderate and $[\rho] > 0.5$ is strong. In addition, non-parametric tests were performed between groups (Mann-Whitney *U* test to compare continuous variables between two groups (i.e. burnout vs. no burnout) and Kruskal Wallis test to compare continuous variables between more than two groups (i.e. low, moderate and high intention to leave). Significance level was set at $p \leq 0.05$.

Results

Characteristics

Of 379 ICU nurses asked to take part in the study, 303 participated, corresponding with a response rate of 79.9% for the three participating hospitals. The majority were female (77.6%) and the median age 37 (IQR 30–45) years. The average work experience was 14 (IQR 6–22) years and 60.1% worked full-time. Nurses' functions varied: 81.8% is working as a nurse, 8.3% as a nurse specialist,

0.3% as a social worker, 0.7% as a midwife, 7.3% as head nurse and 1.7% has another function. 77.2% of these nurses have a Bachelor's degree in nursing, followed by 10.2% graduates and 7.9% with a Master's degree in nursing.

Job satisfaction

Within the total group of ICU nurses, average job satisfaction was $7.66 \pm 1.34/10$ (median = 8; IQR 7–8.5). The histogram of job satisfaction scores is shown in Fig. 1. A small minority of sixteen out of 300 (3 missing) ICU nurses (5,3%) had a score lower than 5, indicating job dissatisfaction. Socio-demographic variables were not associated with job satisfaction.

Communication satisfaction

Scores on the items varied from 1 (very dissatisfied) to 7 (very satisfied). The ICU nurses were most satisfied with the item 'Extent to which my supervisor trusts me' (5.1 ± 1.4) and least satisfied with the item 'Information on realisations and failures of the organisation' (3.3 ± 1.1).

Females had lower scores on the GOP and MQ subscale ($p = 0.012$ and 0.043 , respectively) (Table 2). Nurses with a master degree had lower scores on the MQ and CC subscale as compared to graduate and bachelor nurses ($p = 0.030$ and 0.018 , respectively) (Table 3).

Table 4 shows the mean scores on the items of each subscale (Table 5).

Turnover intention

The numbers and percentages of nurses who answered affirmative on the items probing turnover intention is shown per item in Table 3. It is notable that many nurses thought about changing jobs, but only few were actually planning to do so. Hence, turnover intention was low among the majority of ICU nurses (150/290; 51.7%), moderate among 41.3% (120/290) and high among 6.8% (20/290). Table 6 shows that nurses with low turnover intention are the oldest and have more work experience ($p = 0.001$ and <0.001 , respectively).

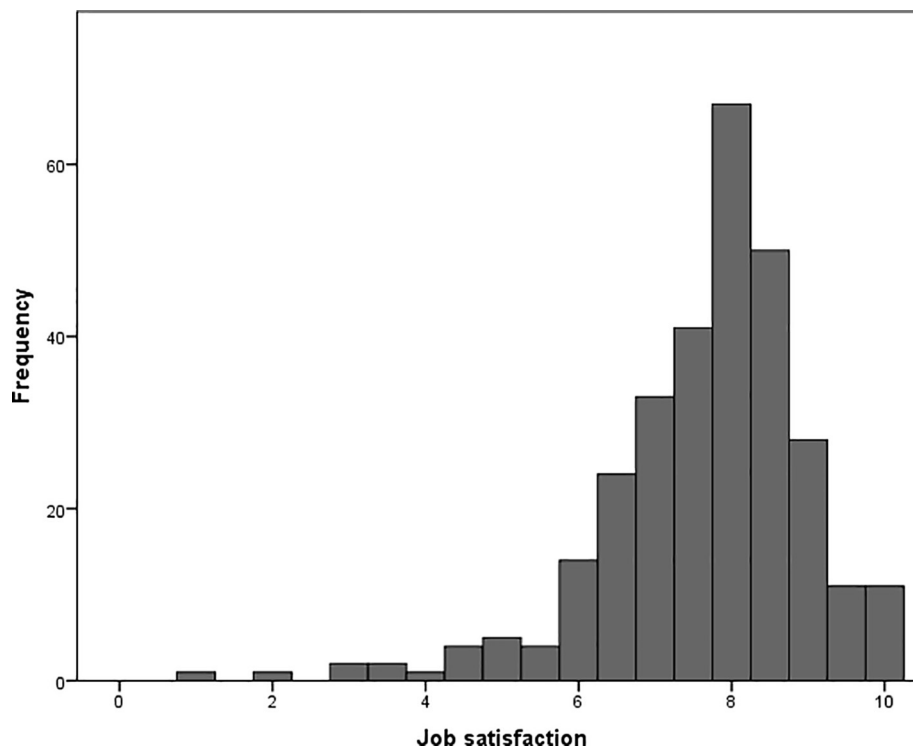


Fig. 1. Job satisfaction.

Table 2
Association of gender with the GOP and MQ subscale of the CSQ.

	Females	Males	p-value
GOP (median & IQR)	3.4 (3.0–4.4)	3.2 (2.6–4.0)	0.012
MQ (median & IQR)	4.0 (3.4–4.8)	3.6 (3.0–4.6)	0.043

Burnout

According to the Maslach Burnout Inventory, 3% (9/299) of the ICU nurses was at risk for burnout.

Further analyses indicate that 23.7% (71/299) of ICU nurses considered their personal accomplishment as low. For example, 17% (51/300) of the nurses said that they never or sporadically could solve the problems of colleagues or patients and 19% (57/300) thought that their work never, sporadically or only occasionally positively influenced the lives of others. The subscales emotional exhaustion and depersonalization were less frequently problematic (33/299; 10.9% and 33/299; 10.9%, respectively). Socio-demographical variables were not associated with burnout.

Associations between communication satisfaction and job satisfaction, intention to leave and burnout risk

All eight dimensions of communication satisfaction were moderately correlated with job satisfaction (-0.300 to -0.485 , all $p < 0.05$, Table 7). Moreover, all dimensions were associated with intention to leave, except for REmp (all $p < 0.01$, Table 8). Nurses with low intention to leave had higher scores on the communica-

Table 4
Mean scores on the items of the subscales.

	Mean \pm SD
General organizational perspective	3.6 \pm 1.0
Organisational integration	4.6 \pm 1.0
Personal feedback	4.2 \pm 1.2
Communication with supervisor	4.8 \pm 1.3
Horizontal and informal communication	4.3 \pm 1.1
Media quality	4.0 \pm 1.1
Communication climate	3.9 \pm 1.2
Communication with employees	4.2 \pm 1.0

Table 5
Affirmative answers on items of turnover intention.

	N	%
Sometimes, I think about changing jobs	163/294	55.4
Sometimes, I think about searching a job outside this organisation	137/295	46.4
I plan to change jobs in the next year	29/296	9.8
I plan to search a job outside this organization in the next year	20/293	6.8

tion dimensions. Finally, all dimensions of communication satisfaction were associated with risk for burnout, except for REmp (all $p < 0.05$, Table 8). Nurses who were at risk for burnout had lower scores on the communication dimensions.

Table 3
Association of education with the MQ and CC subscale of the CSQ.

	Graduate	Bachelor	Master	p-value
MQ (median & IQR)	4.2 (3.0–5.2)	4.0 (3.2–4.8)	3.4 (3.0–4.0)	0.030
CC (median & IQR)	3.4 (2.8–5.2)	3.8 (3.0–4.8)	3.2 (3.0–3.4)	0.018

Table 6

Association of age and work experience with turnover intention.

	Low	Moderate	High	p-value
Age (median & IQR)	40 (32–47)	35 (29–40)	38 (33–41)	0.001
Work experience (median & IQR)	17 (9–24)	12 (6–15)	15 (8–19)	<0.001

Table 7

Associations of communication satisfaction with job satisfaction (Spearman's rho).

	GOP	OI	PF	RSup	HIC	MQ	CC	REmp
Job satisfaction	−0.300	−0.366	−0.387	−0.460	−0.485	−0.411	−0.456	−0.422

GOP: general organisational perspective, OI: organisational integration, PF: personal feedback, RSup: relationship with supervisor, HIC: horizontal and informal communication, MQ: media quality, CC: communication climate, REmp: relation with employees.

Table 8

Mean scores on the communication dimensions, ranging from 1 (very dissatisfied) to 7 (very satisfied), according to intention to leave (Kruskall-Wallis) and burnout risk (Mann-Whitney U).

	Turnover intention			p	Burnout		p
	Low	Moderate	High		No	Yes	
	Mean ± SD	Mean ± SD	Mean ± SD		Mean ± SD	Mean ± SD	
GOP	3.8 ± 1.0	3.4 ± 1.0	3.6 ± 1.1	p = 0.006	3.7 ± 2.8	2.8 ± 0.7	p = 0.017
OI	4.8 ± 1.0	4.4 ± 0.9	4.4 ± 1.0	p = 0.001	4.6 ± 0.9	3.5 ± 0.6	p = 0.001
PF	4.6 ± 1.1	3.9 ± 1.2	4.1 ± 1.2	p < 0.001	4.3 ± 1.2	2.6 ± 0.8	p < 0.001
RSup	5.1 ± 1.3	4.5 ± 1.3	4.6 ± 1.3	p < 0.001	4.8 ± 1.3	3.0 ± 1.3	p = 0.001
HIC	4.5 ± 1.1	4.0 ± 1.0	4.1 ± 0.9	p < 0.001	4.3 ± 1.1	2.8 ± 0.5	p < 0.001
MQ	4.3 ± 1.0	3.8 ± 1.1	3.6 ± 0.9	p < 0.001	4.0 ± 1.1	2.7 ± 0.7	p < 0.001
CC	4.3 ± 1.2	3.6 ± 1.1	3.5 ± 0.9	p < 0.001	3.9 ± 1.1	2.6 ± 0.9	p = 0.001
REmp	4.4 ± 1.0	3.8 ± 1.1	3.0*	p = 0.191	4.2 ± 1.0	3.0*	p = 0.368

GOP: general organisational perspective, OI: organisational integration, PF: personal feedback, RSup: relationship with supervisor, HIC: horizontal and informal communication, MQ: media quality, CC: communication climate, REmp: relation with employees.

* No standard deviation, only one case.

Discussion

This is the first study on communication satisfaction and job satisfaction among ICU nurses. High levels of communication and job satisfaction were documented in a sample ICU nurses of three Flemish hospitals. Moreover, low levels of turnover intention and burnout risk were documented. The average job satisfaction of ICU nurses is comparable with other international studies (Vermeir et al., 2018). The various dimensions of communication satisfaction were associated with job satisfaction and, in turn, job and communication satisfaction were associated with a higher risk for burnout and higher turnover intention albeit that the correlations were not very strong.

ICU nurses were most satisfied with communication with their supervisors. Communication with executives is often described in the literature as an important predictor of job satisfaction (Grieshaber et al., 1995; Probst et al., 2010). Since our respondents were most satisfied with that particular dimension, this may be an explanation for the high overall job satisfaction in this study.

On the other hand, a communication gap seems to exist between the upper management and the work floor. ICU nurses were least satisfied with the information they receive on the organisational perspectives. They were dissatisfied about general information about the organisation, its goals and achievements. The study of Aiken et al. (2013) also denotes dissatisfaction among 80% of Belgian nurses about the opportunity to participate in policy decisions (vs. 63% in the Netherlands and Sweden, 44% in Finland, 68% in Norway, 64% in England) and 72% reported that management did not listen and respond to their concerns (vs. 70% in the Netherlands, 64% in Sweden, 67% in Finland, 36% in Norway, 48%

in England). The Belgian numbers were among the highest as compared to other European countries (Aiken et al., 2013). A recent study among South-African nurses found similar levels of dissatisfaction about organisational perspectives and communication climate (Wagner et al., 2015). Besides, ICU nurses also report a willingness to be more involved in clinical decisions about their patients (Falco-Pegueroles et al., 2016).

In this study the majority of intensive care nurses had a low turnover intention, as only 6.6% reported a high intention to leave. In contrast, the study of van Dam et al. (2013) found that 30% of nurses in the ICU department considered searching another employment. The more favourable outcomes in the present study may be due to the growing attention for ICU work environments in recent years. Moreover, there is a big difference in nurse-to-patient ratio between ICU's and general wards in Belgium: 1:2 versus 1:7.6. The latter is amongst the lowest as compared to other European countries (e.g. 1:3.7 in Norway, 1:4.8 in The Netherlands, but 1:10.2 in Spain). (Aiken et al., 2013; Debergh et al., 2012).

Only three percent of the ICU nurses in this study appeared to be at risk for burnout. This is in contrast with previous research indicating 25 to 33% of ICU nurses having symptoms of severe burnout (Moss et al., 2016). In the present study, more detailed analyses show that 23.7% of intensive care nurses perceived low personal accomplishment. Emotional exhaustion and depersonalisation were less often problematic (10.9%; 10.9%). McHugh et al. estimated burnout rate to be 22% among U.S. nurses (McHugh et al., 2011). In the study by Liu et al. (2015), which also uses the MBI, 75% of respondents reported their personal performance as low, 51% high levels of emotional exhaustion and 40% high depersonalisation. Another study among ICU nurses found emotional

exhaustion to be the most problematic burnout dimension (73%), versus 60% personal accomplishment and 48% depersonalisation (Mealer et al., 2009). These large discrepancies could be explained by differences between the hospitals enrolled in both studies in terms of variations in number of night shifts, work-related stress, conflicts with colleagues or patients, the relationship with the manager and the organisation of the department.

We also conclude that communication satisfaction moderately correlated with job satisfaction. In addition, each dimension of communication satisfaction was also associated with intention to leave and burnout. The correlations, however, were not strong. This could be due to a low number of nurses who were at risk for burnout and a low turnover intention among this study sample. Hence, there was less statistical power to identify associations. Despite this power problem, all correlations were positive, which is a valuable argument to further study the relationship between communication satisfaction and job satisfaction, intention to leave and burnout in a larger sample of nurses.

By including questionnaires on turnover intention and burnout, we have been able to collect data on two relevant topics in daily nursing care. Another strength of this study is the usefulness of the results for policy purposes within the ICU. This information will also contribute to the development of improvement projects around communication (Sharma et al., 2015; Wagner et al., 2015).

Limitations

A limitation of this study is that this is a survey and as such prone to selection bias. As we have no information about the non-responders we cannot assess possible differences in responders and non-responders. Further, the questionnaire items on intention to leave and job satisfaction were rather limited, which contrasts with the comprehensiveness of the CSQ and the MBI. However, two extra complete instruments would have extended the questionnaire, possibly reducing the number of participants. A final limitation relates to the limited generalisability of the Flemish results in three hospitals. Nurse shortage, working conditions and leadership styles can greatly differ between hospitals and between regions, so our results only reflect the situation in the ICUs involved.

Practical guidance

Ideally, communication satisfaction should be periodically monitored to capture changes and to identify the main factors contributing to communication satisfaction (Grieshaber et al., 1995).

Accurate, clear and consistent information should be disseminated towards employees. This applies in particular to issues that affect them and can give rise to gossip (problems, reorganizations...) (Wagner et al., 2015). Furthermore, opportunities for collaboration at all levels should be initiated. This develops and improves good co-worker relationships (Sharma et al., 2015).

Middle management should be informed about corporate information, such as policies affecting the hospital. They are responsible for further distribution and the translation into practice. Secondly, hospital's achievements, financial situation should be communicated through a central communication channel (e-mail, hospital's internal website, written newsletter...).

Managers can educate their employees on the value of effective communication and organize workshops on communication skills (Wagner et al., 2015). They can be role models in terms of effective communication by creating an environment of open communication, investing in face-to-face communication and involving all employees in improvement initiatives.

A communication audit, investigating current and desirable messages and sources, could identify problem areas in written and electronic media quality (Hamilton, 1987). The number of communication sources should be limited and it should be clear which messages come by which media.

Conclusion

This study demonstrated high levels of communication and job satisfaction in a sample of ICU nurses in three Flemish hospitals. A low turnover intention and burnout prevalence was documented. Communication satisfaction moderately correlated with job satisfaction, while communication satisfaction only had minor association with turnover intention and burnout. It is worthwhile for the ICU and hospital management to optimize their internal communication, leading to an effective workplace.

Conflicts of interest

No conflicts of interest to be reported.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.iccn.2018.07.001>.

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