

Discriminating Work Context Factors in the Working Environment of Dutch Nurse Anesthetists

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Abstract : With an ever increasing number of patients and more demanding health care system it is important to keep nurse anesthetists as mentally and physically fit as possible. Especially with a shortage of nurse anesthetists it is important to know which work context factors are important for maintaining a healthy balance between the nurse anesthetist and his work environment. This study is the first to determine which work context factors of nurse anesthetists are most relevant for a healthy work environment. A questionnaire survey, containing work related items, was distributed among all nurse anesthetists working in Dutch hospitals. All together 882 questionnaires (response rate 44%) were completed and analyzed, including factor analysis for the discriminating work context factors.

Four discriminating work context factors (career/rewards, relation with supervisor, task contents and social environment) were found to be relevant, explaining 48% of the variance in work context. All four work context factors are considered to be job resources, although not hospital related. Supervisors (head nurses) interpret these work context factors differently from nurse anesthetists, which can result in dissatisfaction of the latter group. Nurse anesthetists participate more in sub-functions and activities in larger peripheral and academic anesthesia departments. Smaller anesthesia departments require nurse anesthetists to be more flexible and perform many different functions within the anesthesia domain.

Key words : Work context ; nurse anesthetists ; health, resources.

INTRODUCTION

More and better surgical options combined with safer anesthetic techniques have resulted in anesthesia that can be provided to virtually everyone, including the very young, the very old and the very sick patient. At the same time that anesthesia is increasingly safer for patients, it is becoming potentially more hazardous for its practitioners. Each anesthetic can result in unexpected morbidity or mortality, and a malpractice claim can arise from a

bad outcome despite optimal care. All these demands and working conditions are responsible for a certain work context which can result in stress and less job satisfaction (1, 2, 3, 4, 5).

In practice, we need to know which work context factors are important for the nurse anesthetist. Identifying the demands is crucial for hospitals in order to use their resources effectively and prevent negative outcomes, such as lowered health, dissatisfaction and job turnover. The availability of job resources (motivators) can buffer the effect of these demands (6, 7, 8, 9). Anesthesiologists and nurse anesthetists share many occupational stressors with other service professionals, but they also experience unique work environment factors that set them apart : proximity to suffering and death, the emotional and physical needs of patients, and pressures to perform consistently and optimally under changing conditions and expectations. A nurse anesthetist works as a team member closely together with operating nurses and surgeons and is supervised by an anesthesiologist. The national job profile of Dutch

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nurse anesthetists, many guidelines from the anesthesia profession itself and legal restrictions result in a profession in which tasks, responsibilities and functional roles are virtually the same in every hospital, with some small discrepancies at certain tasks. Different studies have shown that burnout prevention strategies are more effective at the occupational level rather than at the individual level (10, 11).

Thus far, work context factors for nurse anesthetists have not been studied. Accordingly, the first objective of the present study was to determine which work context factors are most important in the working environment of Dutch nurse anesthetists. Secondly, we examined how supervisors (head nurse anesthetists) judged the work context factors of nurse anesthetists. The third objective of this study was to determine whether work context factors are related to the profession or to the hospital.

METHODS

All nurse anesthetists (sample 1) working in Dutch hospitals and private clinics were asked to fill out an on-line multiple choice questionnaire containing demographic and work context items. In January 2007, at the annual Dutch national congress of nurse anesthetists, the start of the study was announced and every participant of the congress received an invitation to fill out the online questionnaire. In addition, a personal letter was sent to every member of the NVAM⁽¹⁾ (Nederlandse Vereniging van Anesthesiemedewerkers) asking for participation in the study. Finally, directors of private clinics and employment agencies, specialized in nurse anesthetists, received a letter requesting to participate in this study. The on-line questionnaire was closed in April 2007. From September till November 2007, all head nurse supervisors (sample 2) were asked to fill out the same questionnaire about work context so that we were able to compare the supervisor's view with those of the nurse anesthetists.

We measured characteristics such as age, gender, whether the nurse anesthetists are working with anesthesiology residents, in which type of hospital they work, the number of operating rooms in their department, the numbers of years practicing anesthesia since certification was obtained, and the number of training days they get per five years (Table 1). We also asked for type and number of sub-functions and activities an nurse anesthetist is

participating in. Activities were categorized as an employee participating in or responsible for store room, medication, medical equipment, patient and personnel planning, coaching of students, chairing a meeting, specific projects or others. Sub-functions were categorized as an employee responsible for training of juniors, participating in quality control/management, and were member of the resuscitation team, trauma team or other.

We studied characteristic aspects about the individual work perceptions of nurse anesthetists, based on motivational models introduced by Maslow, Herzberg, Hackman & Oldham and Karasek, all founders of most modern motivation and/or work context questionnaires. As this is the first study about work context factors of nurse anesthetists, we used the most complete questionnaire. Modern motivation or work context questionnaires consist of the following factors: autonomy, social relations, competence and environmental conditions (12, 13, 14, 15, 16). None of these questionnaires examines all four work context factors. As a reaction to this problem the TOMO (TOetsingslijst Mens & Organisatie)⁽²⁾ was, on behalf of TNO (Toegepast Natuurwetenschappelijk Onderzoek)⁽³⁾, developed by Orden and Gaillard (17), which integrated all four factors into one observational list to evaluate psychosocial relations in the working environment⁽⁴⁾. This validated observation list is considered one of the most complete and objective lists and is used by the Dutch and Belgian governments (18, 19). We adjusted the TOMO into a questionnaire, containing 51 items, suitable for nurse anesthetists. For every item we used a five-point Likert scale with 1 = far too few, 2 = too few, 3 = enough, 4 = too much and 5 = far too much.

Correlations between demographic characteristics of the nurse anesthetists (sample 1) and the work context factors were analyzed by ANOVA (Table 2). The validated TOMO observation list was transformed into a 51-item TOMO questionnaire which was analysed using factor analysis (SPSS 16.0 system Inc. Chicago, USA). Principal

(1) Dutch Society of Anaesthesia Assistants.

(2) TOMO: literally translated from Dutch: checklist people & organization.

(3) The TOMO was developed at TNO (www.tno.nl), the official Dutch Independent Scientific Institute that performs applied scientific research.

(4) Questionnaires used for developing the TOMO: ARBIE, IMA module 12, Checklists Manual Work Stress by Kompier and Mercelissen (1990), WEBA, NOVA-WEBA, WEBO, VBBA, VAG, VOS-D, BASAM.

components analysis with varimax rotation (eigenvalues > 1) was used to find the underlying factors. To compare the responses of nurse anesthetists and their supervisors for the four work context factors an independent t-test analysis was done (Table 3).

RESULTS

Out of 2000 Dutch nurse anesthetists, 923 filled out the questionnaire, although 41 failed to complete it entirely and were excluded from further analysis. As a result, the analyses are based on the responses of 882 (44.1%) nurse anesthetists (sample 1; 431 females and 451 men) who filled in the questionnaire completely. The majority of the nurse anesthetists (89.2%) were between 25 and 54 years old, with a peak between 45-49 years (21.2%). Most of the respondents (68.7%) were considered experienced and worked for more than five years as an nurse anesthetist. Out of 111 Dutch nurse anesthesia departments, 69 (62%) head-nurse supervisors (sample 2) responded and filled out the questionnaire completely.

Subsequent analyses were conducted for the TOMO questionnaire until an analysis, in which 26 out of 51-items participated, provided a meaningful four-factor structure with factor 1 'career/rewards' (7 items, $\alpha = .82$) explaining 14% of the variance; factor 2 'relation with supervisor' (6 items, $\alpha = .84$) explaining 13% of the variance; factor 3 'task contents' (8 items, $\alpha = .76$) explaining 12% of the variance; and factor 4 'social environment' ($\alpha = .69$) explaining 9% of the variance. Together, the four factors explained 48% of the variance (see Appendix 1 for more information about these items). Table 1 shows the intercorrelations between the work context scales and the background characteristics.

The results of the independent t-test (Table 3) indicated that nurse anesthetists and their supervisors think similarly about career possibilities and rewards. Differences in view were seen between nurse anesthetists and their supervisors for work context factor 3 'task contents' ($P < 0.05$), work context 4 'social environment' ($P < 0.001$), with the largest difference in factor 2 'relation with supervisor' ($P < 0.001$). Because it is crucial to know the status of the different job demands and resources, we checked the actual status of the four factors in more detail and evaluated the scores for every item at the level of the nurse anesthetist and the supervisor (Table 4). Although work context factor 1 'career/reward' did not differ significantly between

nurse anesthetist and supervisors (Table 3), at the item level there was a significant difference. Nurse anesthetists were significantly less satisfied with their financial rewards than what was believed by their supervisors (salary $t(949) = -6.02$ $P < 0.001$ and financial rewards $t(949) = -2.85$ $P < 0.01$). In contrast, supervisors interpreted the possibilities to design the career of the nurse anesthetists less positive than nurse anesthetists did. Nurse anaesthetists were less positive than their supervisors about the support and appreciation they get from their supervisors (appreciation supervisor $t(84.65) = -4.06$ $P < 0.001$, support supervisor $t(79.09) = -5.56$ $P < 0.001$).

We also studied whether the work context factors are hospital or profession related. No significant relationship was found between the type of hospital (academic vs. non-academic hospitals) or the size of hospital (number of operating rooms) (Table 1). The type of hospital (academic vs. non-academic) was significantly and positively related to the number of sub-functions ($r = .15$, $P < 0.01$) and significantly and negatively to the number of functions ($r = -.32$, $P < 0.01$) (Table 1). The number of operating rooms at the department and the first work context factor 'career/rewards' was significantly different (at $P < 0.05$) (Table 2). The factor ranged from a low of 2.18 for hospitals with one to five operating rooms, to a high of 2.21 for hospitals with more than 10 operating rooms.

DISCUSSION

This is the first study that focuses on work context factors for nurse anesthetists. The four work context factors for Dutch nurse anesthetists are in accordance with and support several other studies (20, 21, 22, 23, 24, 25). According to these studies five work context factors are considered important (8, 18, 20, 21, 25): a) job demands; b) decision latitude or job control (using acquired knowledge and skills allowing to make a decision); c) social support (most important factor to increase employees' resilience); d) physical demands and physical/environmental risk factors; and e) job insecurity (on the labor market requirements for particular skills and possibilities in future career development). Most of these factors are confirmed in our study and applicable for nurse anesthetists: career possibilities and rewards (comparable with resource 'job insecurity'), the relation with supervisor (comparable with resource 'social support'), task contents (comparable with 'decision latitude')

Table 1

Correlations among variables (bivariate, two-tailed). Significant correlation at level * $P < 0.05$, ** $P < 0.01$. Age (years) : < 20 (1), 20-24 (2), 25-29 (3), 30-34 (4), 35-39 (5), 40-44 (6), 45-49 (7), 50-54 (8), 55-59 (9), > 60 (10) ; Gender : men (0), women (1) ; Certificate (years) : < 1 (1), 1-5 (2), 6-10 (3), 11-15 (4), 16-20 (5), > 20 (6) ; Trainings days per five years (days) : 0-5 (1), 6-10 (2), 11-15 (3), more than 15 (4) ; Anaesthesiology residents : yes (1), no (0) ; Salary scale (weight factor) : 45 (1), 50 (2), 55 (3), 60 (4), 6 (1), 7 (2), 8 (3), 9 (4) ; Academic hospital : yes (1), no (0) ; Number of operating rooms : 1-5 (1), 6-10 (2), 11-15 (3), 16 or more (4)

	M	SD	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. age	5.71	1.98	1.00														
2. gender	0.49	0.50	-.28**	1.00													
3. years of certification	3.80	1.78	.82**	-.23**	1.00												
4. training days	2.45	1.18	-.16**	-.08**	-.222**	1.00											
5. anaesthesiology residents	0.46	0.50	-.12**	.05	-.119**	.03	1.00										
6. salary scale	2.96	0.55	.24**	-.15**	.280**	-.03	.00	1.00									
7. academic hospital	0.13	0.34	-.01	.03	-.070*	.04	.40**	.00	1.00								
8. number operating rooms	2.36	0.98	-.08*	.03	-.104**	.08*	.48**	-.01	.54**	1.00							
9. number activities	0.92	0.28	.14**	-.06	.158**	-.03	-.04	.19**	-.06	-.02	1.00						
10. number functions	0.59	0.49	.04	-.08*	.047	.03	-.28**	-.00	-.32**	-.25**	.11**	1.00					
11. number sub-functions	0.53	0.50	.09*	-.10**	.048	.03	.02	.06	.15**	.06	.18**	-.06	1.00				
12. career planning/reward	2.20	0.48	.05	.02	.038	.11**	.07	.02	-.03	-.02	-.04	.02	-.03	1.00			
13. relation with supervisor	2.63	0.46	.01	-.02	.018	.06	.05	.03	-.03	.00	.03	.00	.02	.53**	1.00		
14/ task contents	2.78	0.34	.04	.01	.008	.05	.02	.03	-.02	-.00	.02	-.02	-.01	.48**	.46**	1.00	
15/ social environment	2.72	0.36	.03	-.11**	.03	.01	-.01	.01	.04	.03	.01	.14**	.01	.34**	.38**	.33**	1.00

Table 2

ANOVA interaction of independent variables with work context factors. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$

	Career/rewards		Relation supervisor		Task contents		Social environment	
	df	F	df	F	df	F	df	F
age	19	1.79*	19	.91	31	.79	13	.78
gender	19	.60	19	.71	31	1.40	13	2.15**
certificate	19	1.51	19	1.20	31	.84	13	.84
salary scale	19	1.35	19	.84	31	1.38	13	1.03
training days	19	1.28	19	1.06	31	1.04	13	.87
academic hospital	19	.95	19	.69	31	1.03	13	.47
number operating rooms	19	1.64*	19	1.23	31	.99	13	1.37
anesthesiology residents	19	1.07	19	.89	31	1.10	13	.87
number activities	19	.58	19	.49	31	1.06	13	.80
number functions	19	1.25	19	.38	31	.75	13	2.11*
number sub-function	19	.79	19	.66	31	.90	13	.50

Table 3

Independent t-test comparing work context factors between anesthesia assistants (sample 1) and supervisors (sample 2). * $P < 0.05$, *** $P < 0.001$

Work context factors	Sample 1 (n = 882)		Sample 2 (n = 69)		t (df)	
	mean	SD	mean	SD		
F1 : career/rewards	2.20	0.48	2.27	0.38	t (85,20)	= 1.51
F2 : relation supervisor	2.63	0.46	2.97	0.31	t (92,58)	= 8.43***
F3 : task contents	2.78	0.34	2.89	0.29	t (934)	= 2.46*
F4 : social environment	2.72	0.36	2.92	0.40	t (949)	= 4.35***

and social environment (corresponding to decision latitude and social support). The work context factors in this study are all resources, job demands were not mentioned. The importance of 'relation with supervisor' (work context factor 2) can be explained by the feelings of loneliness and helplessness in difficult clinical situations (26) because it includes support and appreciation by the supervisor.

Several studies mentioned the demands anesthesiologists and nurse anesthetists experience : fatigue, unpredictability of work, fear of litigation, competence pressure, the need for sustained vigilance, erratic opportunities for nutrition, hydration and bathroom breaks, and isolation from anesthesia colleagues (27, 28, 29, 30).

Nurse anesthetists can also experience their work as an assisting function because it is regulated and limited by several guidelines and laws and because they are always supervised by an anesthesiologist. Nurse anesthetists have therefore only a limited influence on the job demands and are consequently more focused on job resources. Maybe this explains why, in this study, job demands were

not considered as a work context factor by the respondents.

Differences between nurse anesthetists and their supervisors (head nurse anesthetists) were found for the three work context factors, except for factor 1 'career/rewards'. We argue that 'career and rewards' contain mostly concrete facts, and therefore they are less likely to be impacted by individual perceptions and are more likely to be scored similarly. The other factors are less concrete, asking more about perceptions and feelings. By analyzing the four factors at each item level, we found significant differences between nurse anesthetist and supervisor (Table 4). Maybe the most important mismatch was found between the items about support (work context factor 2). Nurse anesthetists and supervisors clearly perceive these important constructs differently. Almost every theoretical model about motivation, work load, and burnout confirms the importance of support by the supervisor for a healthy work environment. Nurse anesthetists feel less appreciated, less supported, and believe their opinion does not count to a far greater extent than

Table 4

Independent T-test between the two groups for the work context items. Group 1 = nurse anesthetists, group 2 = supervisors. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$

Factor 1 items	Group 1 (n = 882)		Group 2 (n = 69)		t(df)
	M	SD	M	SD	
salary	2.21	.66	2.71	.67	t (949) = -6.02***
extra reward	1.89	.71	2.14	.62	t (949) = -2.85**
appreciation	2.29	.67	2.30	.60	t (949) = -.11
training possibilities	2.28	.73	2.39	.69	t (949) = -1.27
career possibilities	2.13	.71	2.00	.64	t (81.66) = 1.65
possibilities for development	2.23	.67	2.14	.58	t (83.11) = 1.22
design career	2.34	.62	2.20	.56	t (81.56) = 2.01*
Factor 2 items	M	SD	M	SD	t(df)
possibilities for participation discussion of progress	2.83	.57	3.00	.45	t (85.48) = -3.00**
possibilities for discussing during discussion of progress	2.88	.50	3.00	.42	t (83.62) = -2.32*
information about department policy	2.32	.67	2.67	.63	t (949) = -4.22***
appreciation supervisor	2.57	.65	2.84	.53	t (84.65) = -4.06***
support supervisors	2.51	.67	2.97	.66	t (79.09) = -5.55***
take into account one's opinion	2.66	.61	3.33	.53	t (82.53) = -9.94***
Factor 3 items	M	SD	M	SD	t(df)
variation	2.69	.63	2.80	.58	t (949) = -1.40
problem solving	2.88	.58	2.96	.60	t (949) = -1.11
one's duties	2.83	.60	2.86	.52	t (949) = -.38
complete whole	2.73	.57	2.68	.58	t (949) = .62
own way	2.78	.48	3.01	.55	t (949) = -3.88***
own responsibilities	2.93	.53	2.94	.57	t (949) = -.24
gained knowledge	2.70	.54	2.91	.45	t (84.74) = -3.70***
gained skills	2.73	.53	2.94	.42	t (86.38) = -3.90***
Factor 4 items	M	SD	M	SD	t(df)
freedom of movement	2.6474	.58290	2.9130	.65841	t (949) = -3.61**
contact colleagues	2.6565	.57660	2.8406	.60932	t (949) = -2.54
informal contacts	2.7007	.54635	2.8841	.67598	t (949) = -2.64**
give room	2.7619	.49285	2.8261	.59301	t (949) = -1.03
taking a break	2.8333	.46986	3.1159	.47080	t (949) = -4.81***

what their supervisors think. These differences may result in nurse anesthetists and supervisors having very different goals and needs. A mismatch in importance of these work context factors between nurse anesthetists and supervisors can lead to less job satisfaction among nurse anesthetists, higher levels of burnout, a greater likelihood of turnover, and failing leadership.

We found no correlation between the four work context factors and the size or type of the anaesthesia department, although the first work context factor (career/rewards) is significantly different in the number of operating rooms (Table 2). It is possible that this is caused by a staff shortage and the corresponding financial bonus system. We examined whether the number of functions, sub-functions and activities are related with size and type of hospital. Career and rewards (factor 1) were not related to the number of functions or sub-functions in anesthesia departments. Functions, sub-

functions, and activities can be seen as a horizontal function differentiation or career planning and creates possibilities for a non-financial reward system. However, we did not collect information that allowed us to determine this relationship.

The number of sub-functions, e.g. member of resuscitation, or trauma teams and the supervisor of the nurse anesthetist students, are larger in academic hospitals. Unfortunately, we did not evaluate the number of these students per hospital, and therefore cannot study the relationship between the presence of a supervisor of the students and the number of nurse anesthetist students at an anaesthesia department. The number of functions differs significantly with social environment, and is negatively correlated with the size and type of hospital (academic vs. non-academic). The variable 'social environment' contains items such as the quality and amount of contacts a nurse anesthetist has with others. If the nurse anesthetist participates in more sub-functions,

more social interactions are available. The relationship between the number of functions, the number of operating rooms, and type of hospital can be explained by the organizational limitations of smaller hospitals. In smaller anaesthesia departments, supervisors want their nurse anesthetists to work in many functions to increase the flexibility of the department.

Self-reports and questionnaires are subject to a number of biases. Nurse anesthetists create their own work approach and environment depending on personality traits. As described by DE CROON (31) employees who suffer from strain are more likely to show turnover. This self selection process allows comparatively healthy nurse anesthetists to remain in the job, whereas those who changed jobs (and occupation) are less healthy. This bias effect is called the 'healthy worker survivor effect', which can mean that our population experiences a higher level of resources. Whether these findings in the Dutch system of nurse anesthetists are applicable to other countries, still has to be defined. Further study is necessary to examine the exact meaning and influences of different interpretations of work context by using multilevel models, isomorphic models (32) or by a 360 degree feedback system.

CONCLUSION

In this study, we found four work context factors (career/rewards, relation with supervisor, task contents and social environment), which are all job resources that explain 48% of variance in work context, which Dutch nurse anesthetists consider important in their job. It is crucial to find the right job resources to effectively buffer specific negative or stressful job demands. These four work context factors serve as the essential buffers for job demands among Dutch nurse anesthetists. The size and type of the anesthesia department did not show to have an impact. Supervisors differed from nurse anesthetists in their perception of the work context factors 'relation with supervisor', 'task contents' and 'social environment'. As supervisors often make decisions about the overall work context of nurse anesthetists, it is likely that this discrepancy results in lower job satisfaction in nurse anesthetists.

Knowing which work context factors are important, further studies are necessary to determine the influence of these four work context factors on burnout, job satisfaction and job turnover. Only then we can develop an effective policy for a healthy work environment for nurse anesthetists.

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Appendix 1

Items of the four work context factors

Work context factor 1 : career/rewards

1. the level of the salary for the function of nurse-anesthetist
2. extra bonus salary if extra functions/tasks are performed
3. appreciation for me in the hospital
4. opportunities for education/training
5. career possibilities
6. possibilities for development
7. possibilities to influence my career

Work context factor 2 : relation supervisor

1. possibilities for participation discussion of progress
2. possibilities to propose an item during the discussion of progress
3. information about the department's policy
4. appreciation by my supervisor
5. support at work by my supervisor
6. my supervisor takes into account my opinion

Work context factor 3 : task contents

1. enough variation in my job during the day
2. opportunities to solve my own problems
3. my work includes preparative, executional, organisational and supportive tasks
4. my work is well-defined
5. execute my job in my own way
6. own responsibilities in my job
7. implementation of gained knowledge in practice
8. implementation of gained skills in practice

Work context factor 4 : social environment

1. freedom of movement during my work
2. contacts with my colleagues during my working day
3. possibilities to have informal contacts with others
4. give room to do my job
5. possibilities to take a break during the day