

REVIEWS

Selection of an instrument to evaluate the organizational environment of nurses working in intensive care: an integrative review

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Abstract

Objective: To determine an appropriate survey instrument to evaluate the impact of organizational structures on the work environment of intensive care nurses.

Background: Internationally the demand for intensive care is increasing. Solely increasing bed capacity is not sustainable. Large capacity multi-specialty Intensive Care Units are emerging as the preferred organizational model with benefits resulting from optimizing operational synergies and economies of scale. The impact of this organizational transition on intensive care nurses is not well understood. An appropriate survey instrument for intensive care nurses is required. Design: Integrative literature review. Data Sources: CINAHL, PubMed, EMBASE and OVID Nursing databases searched for studies published between 2005 and 2013.

Review methods: An integrative review and quality assessment of the studies was undertaken to select nurse outcome measures associated with organizational structures across a range of acute and critical care settings. Congruence between nurse outcome measures and nurse survey instruments tested in the literature was assessed to select instruments for further psychometric evaluation.

Results: Thirty-one cross sectional quantitative studies, from fourteen countries, were reviewed. Twenty one nurse outcome measures associated with organizational factors were identified and a total of twenty five survey instruments used in the studies reviewed. Assessment of congruence and psychometric properties determined that a combination of two instruments is required to comprehensively assess the organizational environment of nurses working in intensive care units.

Conclusion: The environment of nurses working in intensive care is effectively evaluated with an instrument that combines subscales from the Practice Environment Scale-Nurse Work Index and Maslach's Burnout Inventory.

Key words

Nurse, Intensive care, Critical care, Organization, Environment, Outcome, Satisfaction

1 Introduction

Intensive Care Units (ICUs) support critically ill patients that require complex clinical management, sophisticated technologies and high resource inputs. Internationally, the demand for intensive care is growing due to aging populations, higher inpatient acuity with increasing multiple co-morbidities and advanced medical technologies^[1,2].

Effective demand management aims to improve utilization of available bed capacity while optimizing patient and staff outcomes^[3]. An established demand management strategy is coordinated networking between hospitals for the referral of critically ill patients to access definitive care^[4,5]. As a result organizational transformation in the form of regionalization, or consolidation, of ICU services is being adopted across clinical networks and within individual hospitals^[6].

Large-capacity multi-specialty ICUs are emerging as the preferred organizational model in tertiary and regional referral hospitals where historically multiple sub-specialty ICUs operated separately^[2,4,7]. Typically these units range from fifty to seventy beds, in contrast to the traditional ICU model of between ten and twelve beds, and require a large clinical workforce^[7-9].

Benefits are thought to be linked to consolidation and better utilization of expertise and resources^[2,10]. Flexible patient flow, economies of scale, enhanced operational synergies and standardization of practice underpin the benefits achieved^[11-13].

Increasing bed capacity alone is not sustainable, however, in terms of both fiscal and human resources^[14,15]. Structural changes to the work environment are required to achieve organizational transformation and include nursing management models, nurse staffing, rostering, professional development and the need for a large nursing workforce^[13].

A major challenge is effective management of the large nurse workforce required on a 24-hour basis, so as to optimize nurse outcomes such as staff satisfaction and retention^[16,17]. Nurse outcomes have been investigated in acute care environments^[18,19], however, intensive care nurse outcomes are not so well understood and may result in the adoption of unsustainable organizational models^[20-22]. A survey instrument sensitive to organizational factors and culture, with strong psychometric properties, is required to evaluate the working environment of intensive care nurses, inform managers and promote workforce sustainability in the face of organizational change.

2 Method

An integrative literature review of the empirical literature was conducted using methodological approaches described by Cooper (1982)^[23] and Dixon-Woods *et al.* (2004)^[24] for integrative reviews of quantitative and qualitative research. An integrative approach includes a diverse range of study designs, if present in the literature, thereby providing a broad perspective that enriches the understanding of the topic^[25]. Key review stages included a review of acute care nurse outcome studies, quality assessment, identifying nurse outcome measures and the survey instruments tested, followed by an assessment of the selected instrument psychometric properties.

2.1 Search method

During the literature search stage, the first author interrogated the CINAHL, PubMed, EMBASE and OVID Nursing databases for English language studies published internationally between 2005 and 2013 (December). Early literature from 2005 was included to capture seminal studies by Manojlovich *et al.* (2005)^[26] and Stone *et al.* (2006)^[3]. The keyword used for the search was “nurse” with advanced searching cross-referencing the search terms “intensive care”, “critical care”, “ICU”, “environment”, “organization”, “outcome” and “satisfaction”.

Studies reviewed were included based on the following criteria: (1) empirical study reports; (2) studies conducted in an acute care environment; (3) explicit study of the association between nurse outcomes and organizational factors; and

(4) psychometric properties of the survey instrument used was defined. Exclusion criteria included: (1) non-English language publications; (2) non-adults; and (3) editorials or unpublished dissertations.

2.2 Search results

The search yielded a total of 309 studies of which thirty nine were initially retained. Further analysis excluded three studies that used either a locally developed non-validated survey instrument tested on a small sample of nurses^[27,28] or focused on nurse-sensitive patient outcomes^[29]. Five studies were excluded as they focused solely on validating survey instruments through subscale factor analysis^[31-34]. The procedure and outcomes are outlined in Figure 1.

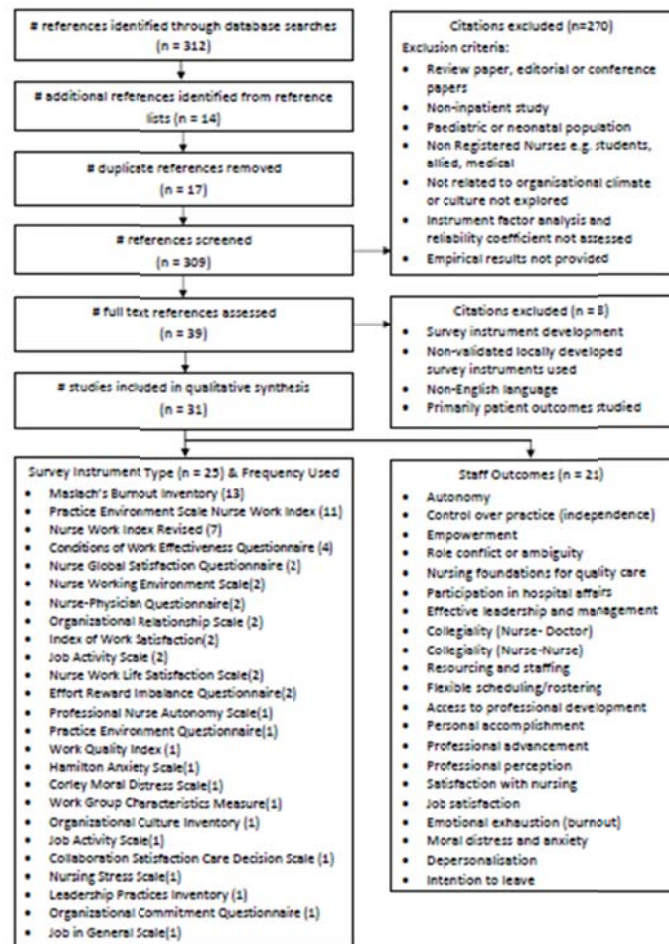


Figure 1. Literature search summary flow chart

Note. Definitions of survey instruments available from the author on request.

Conclusion

Thirty one studies were retained for full analysis as summarized in Table 1. Twenty one nurse outcomes were identified for further exploration. Twenty five survey instruments were used either singularly or in combination as listed in Figure 1. A comprehensive quality appraisal was then undertaken to further validate the inclusion of identified studies in this review.

2.3 Quality appraisal

Quality was assessed based on criteria recommended in the Critical Review of Quantitative Research Worksheet and aligned with the methods promoted in the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement^[35,36]. Each criteria was assessed using an allocated score based on the evidence hierarchy proposed by Evans (2003)^[37]. This scoring process, first developed by Beck (1995)^[38] and applied recently to a literature review of nurse turnover costs conducted by Li *et al.* (2012)^[39], was adopted and expanded with additional quality criteria proposed by Miller (2006)^[35].

Table 1. Literature review result summary

Author	Study Design	Survey Tool	Cronbach α (composite)	Sample (n)	Inpatient Clinical Unit	Workplace Evaluation Results					
						Outcome	Variable	Stat ^z	95% CI/SD	*	
Van Bogaert <i>et al.</i> 2013, Belgium	PCS [†] Survey	NWI-R MBI	0.80	1108 RN	Hospital wide acute care (n = 8 hospitals, nursing units = 96)	Job satisfaction	Nurse-Physician collegiality	OR 2.28	1.46-3.54	<0.001	
							Nurse management (unit)	OR 10.7	4.97-23.06	<0.001	
							Organisational support	OR 9.42	4.23-20.96	<0.001	
							Workload	OR 0.35	0.21-0.57	<0.001	
							Autonomy	OR 5.27	2.45-11.36	<0.001	
							Emotional exhaustion	OR 0.40	0.33-0.49	<0.001	
							Depersonalisation	OR 0.55	0.44-0.68	<0.001	
							Personal accomplishment	OR 1.62	1.25-2.12	<0.001	
							OR 1.71	1.13-2.59	<0.05		
						No intention to leave	Nurse-Physician collegiality	OR 4.10	2.05-8.21	<0.001	
							Nurse management (unit)	OR 9.42	2.09-8.53	<0.001	
							Organisational support	OR 0.56	0.36-0.87	n/s ⁵	
							Workload	OR 1.82	0.93-3.57	n/s	
							Autonomy	OR 0.59	0.49-0.71	<0.001	
							Emotional exhaustion	OR 0.72	0.58-0.89	<0.001	
							Depersonalisation	OR 1.64	1.28-2.12	<0.01	
							Personal accomplishment	OR 2.92	1.89-4.51	<0.001	
							Quality of care (perceived)	Nurse-Physician collegiality	OR 50.2	19.67-128	<0.001
Nurse management (unit)	OR 6.87	3.52-14.25	<0.001								
Organisational support	OR 0.77	0.49-1.20	n/s								
Workload	OR 7.03	3.36-14.71	<0.001								
Autonomy	OR 0.68	0.57-0.82	<0.001								
Emotional exhaustion	OR 0.66	0.53-0.82	<0.001								
Depersonalisation	OR 1.48	1.16-1.88	<0.001								
Job satisfaction	Perceived leadership qualities:										
	Modelling the way	$r = 0.23$	n/a ⁴	= 0.01							
	Inspiring shared vision	$r = 0.24$	n/a	= 0.01							
	Challenging the process	$r = 0.23$	n/a	= 0.02							
	Enabling	$r = 0.21$	n/a	= 0.02							
	Encouraging the heart	$r = 0.13$	n/a	= 0.15							
	Organisational commitment	$\beta = 0.35$	n/a	= 0.00							
Job satisfaction	Emotional exhaustion	$r = -0.41$	n/a	<0.001							
	Depersonalisation	$r = -0.31$	n/a	<0.001							
Myhren <i>et al.</i> 2013, Norway	PDC [#]	MBI	0.70	129 RN	ICUs (n = 3)	Job stress	Personal accomplishment	$r = 0.12$	n/a	= 0.145	
							Emotional Exhaustion	$r = 0.586$	n/a	<0.001	
						Job satisfaction	Depersonalisation	$r = 0.293$	n/a	<0.001	
							Personal accomplishment	$r = 0.105$	n/a	= 0.208	
Coetzee <i>et al.</i> 2013, South Africa	PCS [†] Survey	PESWI MBI	0.79 0.88	1187 RN	Hospital wide acute care, (n = 62 hospitals)	Burnout	Practice Environment	OR 0.55	0.41-0.75	= 0.01	
							Workload	OR 1.03	0.96-1.10	n/s	
						Job dissatisfaction	Practice Environment	OR 0.47	0.34-0.66	= 0.01	
							Workload	OR 1.04	0.96-1.13	n/s	
						Intent to leave	Practice Environment	OR 0.64	0.49-0.84	= 0.01	
							Workload	OR 1.04	0.99-1.10	n/s	
						Poor quality	Practice Environment	OR 0.55	0.41-0.74	= 0.01	
							Workload	OR 1.06	1.01-1.12	= 0.05	
						Poor Management	Practice Environment	OR 0.41	0.31-0.55	= 0.01	
							Workload	OR 1.01	0.92-1.12	n/s	
Poor safety	Practice Environment	OR 0.48	0.29-1.02	n/s							
Workload	OR 1.11	1.00-1.24	= 0.05								
Aiken <i>et al.</i> 2012, Europe & US	PCS [†] Survey	PES-N WI MBI	Referenced from other studies	US 27,509	Hospital wide acute care (n = 488EU+ 612US hospitals)	(EU)	Poor quality	Practice Environment	OR 0.56	0.51-0.61	< 0.05
							Poor safety	Practice Environment	OR 0.50	0.44-0.56	< 0.05
							Burnout	Practice Environment	OR 0.67	0.61-0.73	< 0.05
							Dissatisfaction	Practice Environment	OR 0.52	0.47-0.57	< 0.05
							Intent to Leave	Practice Environment	OR 0.61	0.56-0.67	< 0.05
							Poor mgmt. (US)	Practice Environment	OR 0.53	0.48-0.58	< 0.05
							Poor quality	Practice Environment	OR 0.54	0.51-0.58	< 0.05
							Poor safety	Practice Environment	OR 0.55	0.50-0.61	< 0.05
							Burnout	Practice Environment	OR 0.71	0.68-0.75	< 0.05
							Dissatisfaction	Practice Environment	OR 0.60	0.57-0.64	< 0.05
							Intent to Leave	Practice Environment	OR 0.69	0.64-0.75	< 0.05
							Poor mgmt.	Practice Environment	OR 0.56	0.54-0.59	< 0.05

(Table continued on page 147)

Table 1. (continued)

Author	Study Design	Survey Tool	Cronbach α (composite)	Sample (n)	Inpatient Clinical Unit	Workplace Evaluation Results				
						Outcome	Variable	Stat [‡]	95% CI/SD	*
Purdy <i>et al.</i> 2010, Canada	PCHS [§]	CWEQII WGCM NGSQ	0.86 0.78 0.81	679 RN	Hospital wide acute care (n = 21 hospitals)	Nurse Empowerment	Job satisfaction	$r = 0.39$	n/s	< 0.001
							Practice environment	Participation	$t = 4.68$	n/s
Roche <i>et al.</i> 2010, Australia	2 nd analysis of data	PES-NWI	0.82	2556 Nurses	Acute care and mental health (n= 26 hospitals)		Nursing foundations for care	$t = -2.81$	n/s	≤ 0.01
							Leadership	$t = 4.06$	n/s	≤ 0.01
							Staffing and resourcing	$t = -2.02$	n/s	$= 0.04$
							Collegiality (nurse-doctor)	$t = -6.38$	n/s	≤ 0.01
Van Bogaert <i>et al.</i> 2010, Belgium	PCS [†]	NWI-R MBI	0.75 0.83	546 RN	Hospital wide acute care (n = 4 hospitals)	Job satisfaction Intention to stay	Collegiality (nurse-doctor)	OR 3.94	2.90-7.07	< 0.0001
							Leadership	OR 9.07	3.15-26.2	< 0.0001
							Organisational support	OR 17.2	7.07-72.4	< 0.0001
							Collegiality (nurse-doctor)	OR 2.26	1.23-4.14	< 0.05
							Leadership	OR 3.31	0.99-11.2	< 0.05
Duffield <i>et al.</i> 2010, Australia	2 nd analysis of data	NWI-R	0.80	2141 Nurses (1559 RN)	Hospital wide acute care (n = 21 hospitals)	Job satisfaction	Praise and recognition	OR 1.47	1.30-1.67	< 0.01
							Philosophic foundations	OR 1.26	1.09-1.45	< 0.01
Cai <i>et al.</i> 2009, China	PCS [†]	CWEQII JAS ORS	0.82 0.80 0.89	189 Staff Nurses	Hospital wide acute care (n = 2 hospitals)	Job satisfaction	Empowerment	$r = 0.56$	n/s	$= 0.01$
							Opportunity	$r = -0.22$	n/s	$= 0.01$
							Resources	$r = -0.30$	n/s	$= 0.01$
							Organisational support	$r = -0.48$	n/s	$= 0.01$
							Empowerment	$r = -0.31$	n/s	$= 0.01$
Cho <i>et al.</i> 2009, South Korea	PCS [†]	MBI	n/s	1365 RN	ICU (n = 65)	Adequate staffing	Job dissatisfaction	OR 0.30	0.23-0.40	< 0.05
							Burnout	OR 0.50	0.34-0.73	< 0.05
							Intent to leave	OR 0.40	0.28-0.56	< 0.05
Gunnars dottir <i>Et al.</i> 2009, Iceland	PCS [†]	NWI-R MBI	0.77 0.84	695 RN	Hospital wide acute care, (n = 1 hospital)	Job satisfaction	Nurse-Physician relations	OR 2.40	1.59-3.62	< 0.001
							Unit level support	OR 6.70	4.10-10.9	< 0.001
							Staffing	OR 2.23	1.63-3.05	< 0.001
							Philosophy of practice	OR 2.21	1.47-3.32	< 0.001
							Hospital level support	OR 2.95	1.93-4.52	< 0.001
							Nurse-Physician relations	β -2.38	SE 0.63	< 0.001
							Unit level support	β -3.81	SE 0.64	< 0.001
							Staffing	β -3.95	SE 0.47	< 0.001
							Philosophy of practice	β -2.79	SE 0.65	< 0.001
							Hospital level support	β -2.81	SE 0.66	< 0.001
Van Bogaert <i>et al.</i> 2009, Belgium	PCS [†]	NWI-R MBI	0.75 0.83	155 RN	Hospital wide acute care (n = 13 hospitals)	Nurse-Doctor colegiality	Job satisfaction	OR 8.80	2.60-29.6	< 0.01
							Intention to leave	OR 5.90	1.40-25.0	< 0.01
							Nurse Leadership	OR 2.90	n/s	< 0.01
							Personal accomplishment	β 3.20	(SE) 0.8	< 0.01
							Emotional exhaustion	β -3.70	(SE) 1.2	< 0.01
						Leadership	Depersonalisation	β -0.90	(SE) 0.7	n/s
							Job satisfaction	OR 2.90	0.90-9.00	n/s
							Intention to leave	OR 1.80	1.40-7.60	n/s
							Personal accomplishment	β 3.10	(SE) 1.1	< 0.01
							Emotional exhaustion	β -3.30	(SE) 1.6	< 0.01
						Organisational support	Depersonalisation	β -1.00	(SE) 0.9	n/s
							Job satisfaction	OR 7.60	0.90-65.1	n/s
							Intention to leave	OR 2.90	0.30-26.6	n/s
							Personal accomplishment	β 2.70	(SE) 1.0	< 0.01
							Emotional exhaustion	β -2.80	(SE) 1.4	< 0.01
Aiken <i>et al.</i> 2008, US	PCS [†]	PES-NWI MBI	0.79 0.92	10,184 RN	Hospital wide acute care (n = 168 hospitals)	Care environemnt Nurse staffing	Burnout	OR .76	0.70-0.82	< 0.01
							Job satisfaction	OR 0.75	0.68-0.81	< 0.01
							Intent to leave < 1yr	OR 0.87	0.79-0.96	< 0.01
							Burnout	OR 1.17	1.09-1.25	< 0.01
							Job satisfaction	OR 1.11	1.04-1.18	< 0.01
Intent to leave < 1yr	OR 1.03	0.95-1.12	< 0.10							

(Table continued on page 149)

Table 1. (continued)

Author	Study Design	Survey Tool	Cronbach α (composite)	Sample (n)	Inpatient Clinical Unit	Workplace Evaluation Results				
						Outcome	Variable	Stat [†]	95% CI/SD	*
Faulkner <i>et al.</i> 2008, Canada	PCS [†]	CWEQ-II PEQ ERIQ	0.80 0.89 0.77	282 RN	Hospital wide acute care (n = 168 hospitals)	Prof. Respect	Structural empowerment	$r = 0.47$	n/a	< 0.05
							Informal power	$r = 0.44$	n/a	< 0.05
							Support	$r = 0.38$	n/a	< 0.05
							Formal power	$r = 0.34$	n/a	< 0.05
							Resources	$r = 0.32$	n/a	< 0.05
							Information	$r = 0.30$	n/a	< 0.05
							Opportunity	$r = 0.24$	n/a	< 0.05
							Psychological empowerment	$r = 0.32$	n/a	< 0.05
							Autonomy	$r = 0.31$	n/a	< 0.05
							Impact	$r = 0.25$	n/a	< 0.05
Manojlovich <i>et al.</i> 2008, US	PCS [†]	ICU-NPQ	0.85	462 RN	ICU (n= 25 units)	Job satisfaction	Nurse-Doctor communication	$r = 0.34$	n/a	< 0.001
Lai <i>et al.</i> 2008, Taiwan	PCS [†]	Locally Developed (Coopers)	0.84	130 RN	ICU (n=2 units)	Intention to leave	Level of happiness	\bar{x} 2.27	SD 0.85	< 0.01
							Depression	\bar{x} 4.25	SD 1.85	< 0.01
							Job satisfaction	\bar{x} 6.75	SD 1.61	< 0.01
Stordeur <i>et al.</i> 2007, Belgium	PCS [†]	NEXT NSS COPSOQ ERIQ	0.86 0.74 0.84 0.72	1175 RN	Hospital wide acute care (n = 12 hospitals)	Organisation climate	Schedule/roster flexibility	\bar{x} 4.2	n/s	< 0.001
							Workload	\bar{x} 3.0	n/s	< 0.001
							Emotional exhaustion	\bar{x} 3.3	n/s	< 0.001
							Role ambiguity	\bar{x} 2.2	n/s	< 0.001
							Nursing management	\bar{x} 3.1	n/s	< 0.001
							Nursing team communication	\bar{x} 3.1	n/s	< 0.001
							Job satisfaction	\bar{x} 3.8	n/s	< 0.001
							Burnout	\bar{x} 3.5	n/s	< 0.001
							Intention to leave	\bar{x} 2.2	n/s	< 0.001
							Stone <i>et al.</i> 2006, US	PCS [†]	PNWE (NWI-R)	0.78
Nursing management	\bar{x} 2.24	SE 0.08	< 0.001							
Staffing and resource adequacy	\bar{x} 2.77	SE 0.06	< 0.001							
Nursing process	\bar{x} 2.34	SE 0.06	< 0.001							
Nurse-Doctor collegiality	\bar{x} 2.51	SE 0.07	< 0.001							
Nursing competence	\bar{x} 2.92	SE 0.09	< 0.001							
Positive scheduling climate	\bar{x} 2.48	0.42-0.64	< 0.01							
Professional practice	OR 0.52	0.51-1.08	n/s							
Nursing management	OR 0.74	0.88-1.72	n/s							
Staffing and resource adequacy	OR 1.23	0.54-1.20	n/s							
Nursing process	OR 0.81	0.85-2.03	n/s							
Nurse-Doctor collegiality	OR 1.31	0.44-0.83	< 0.01							
Nursing competence	OR 0.61	0.60-1.11	n/s							
Positive scheduling climate	OR 0.81	0.61-1.63	n/s							
Bed size (small)	OR 1.00	0.78-1.88	n/s							
Manojlovich <i>et al.</i> 2005, US	PCS [†]	CWEQ-II PES-NWI IWS	0.90 0.93 0.92	284 RN	Hospital wide acute care (n = n/s) Multi.	Structural empowerment Practice environment Job satisfaction	Nurse-Doctor communication	β 0.27	n/s	\leq 0.05
							Job satisfaction	β 0.22	n/s	\leq 0.05
							Nurse-Doctor communication	β 0.22	n/s	\leq 0.05
							Job satisfaction	β 0.39	n/s	\leq 0.05
							Nurse-Doctor communication	β 0.37	n/s	\leq 0.05
							Structural empowerment	β 0.22	n/s	\leq 0.05
Minvielle <i>et al.</i> 2005, France	PCS [†]	OCI MBI	> 0.70 > 0.70	1000 (RN = 750)	Hospital wide acute care (n = n/s) Multi.	Job satisfaction	Participation (affiliation)	$r = 0.36$	n/s	< 0.001
							Empowerment	$r = -0.11$	n/s	< 0.01
							Competence	$r = 0.02$	n/s	< 0.001
							Achievement	$r = 0.25$	n/s	< 0.001
							Self actualising	$r = 0.36$	n/s	< 0.001

Note. † Statistic legend: * significance; ρ = Pearson's Correlation coefficient; r = sample correlation coefficient; β = regression coefficient; OR = odds ratio; t = t-test; \bar{x} = mean; † PCS = Prospective Cross Sectional Survey; ‡ PDC = Prospective Descriptive Correlation; § PCHS = Prospective Cohort Study; n/a = not applicable; n/s = not specified.

Thirty one criteria were used to derive a quality index score for each study. Potential study bias was assessed using the risk assessment process adapted from a Cochrane Systematic Review undertaken by Inglis *et al.* (2010) [40]. The highest composite score attainable was seventy seven. Each score was then converted to percentages to assess the relative quality for each study (see Figure 2).

The mean quality index score was 85% with minimal variability in the range (75%-91%). Highest scores reflected multicenter studies with a large sample size, clearly defined outcome measures, demonstrated survey instrument validation, high survey response rate, identified complex associations within the results and demonstrated relevance to health services management [41, 42]. Conversely, the lowest scoring study was conducted in a single site with a small

convenience sample, and implications for practice were not clearly articulated limiting broader generalization of results [43].

All studies, except one [42], failed to explicitly define the study population exclusion criteria potentially affecting sample selection, with the majority using a convenience sample. While this may limit generalization of results, sample sizes were considered to be moderate to large (range n = 67 to 98,116), mitigating this risk.

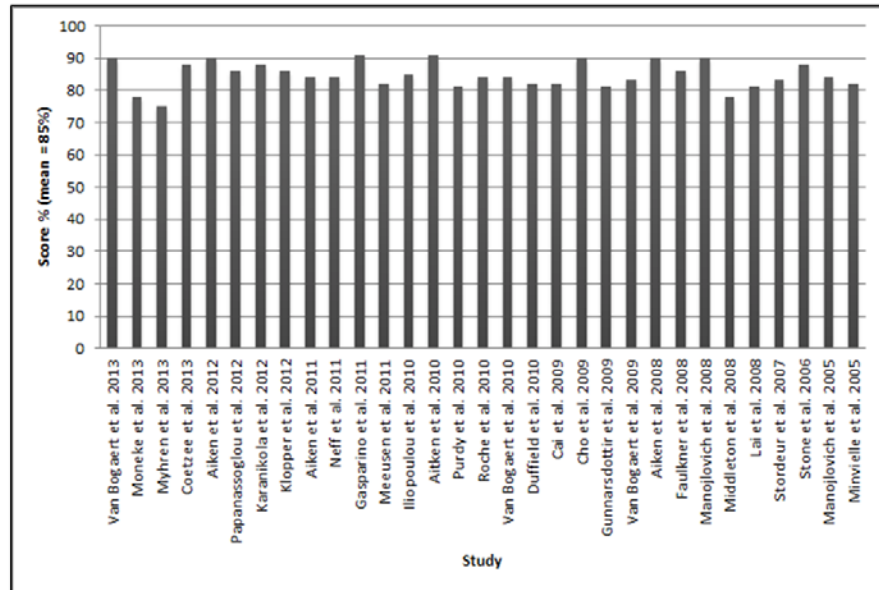


Figure 2. Relative derived quality index scores

Seven studies also employed randomization to control for confounding [3, 26, 44-47]. Overall the studies were primarily multi-site from a broad range of countries with two being multi-national [45, 48]. All studies were undertaken in an acute care environment with nine studies specific to adult ICU. A majority of studies were strong in terms of author expertise, clear study purpose, prospective study design and using psychometrically validated survey instruments. Results were comprehensively reported using clear descriptive summaries, empirical statistical analysis and identification of significant associations between structural characteristics of the workplace environment and nurse outcomes. These results were then further qualified through reporting of small standard errors, standard deviations and/or narrow confidence intervals. Overall the quality of the studies was high (see Figure 2) further supporting the inclusion of the twenty one identified nurse outcomes in the minimum dataset.

2.4 Data abstraction and synthesis

At the data analysis stage the authors followed the sequence proposed by Whittemore and Knafl (2005) including data reduction, data display, data comparison and verification of conclusions [25]. The data were reduced by extraction of nurse outcome measures as summarized in Table 1. This enabled a systematic identification of nurse outcomes associated with organizational factors from the described statistical testing, associations and conclusions. Nurse outcomes were reduced to a minimum dataset against which the survey instruments were aligned to assess the degree of congruence with the outcomes collected by each instrument.

Conclusion

Systematic appraisal found overall a high level of study quality in terms of research methodology and reporting. This provided the reviewers with confidence regarding the validity of nurse outcome measures identified. Further analysis of individual outcome measures was undertaken to statistically validate the final dataset of nurse outcome measures used to select an appropriate survey instrument.

3 Results

3.1 Nurse outcomes associated with organizational structures in the work environment

Repeated testing across multiple studies supports the reliability of nurse outcome measures. Figure 3 illustrates the frequency each nurse outcome was measured. Job satisfaction, intention to leave, leadership, emotional exhaustion (burnout), resourcing and staffing, and Nurse-Doctor collegiality were frequently used to study nurse work environments. In contrast, professional advancement and satisfaction with nursing in general were measured only once in separate large multicenter studies with high relative quality index scores [48, 49]. All twenty one nurse outcome measures were therefore retained for further evaluation in order of highest to lowest frequency.

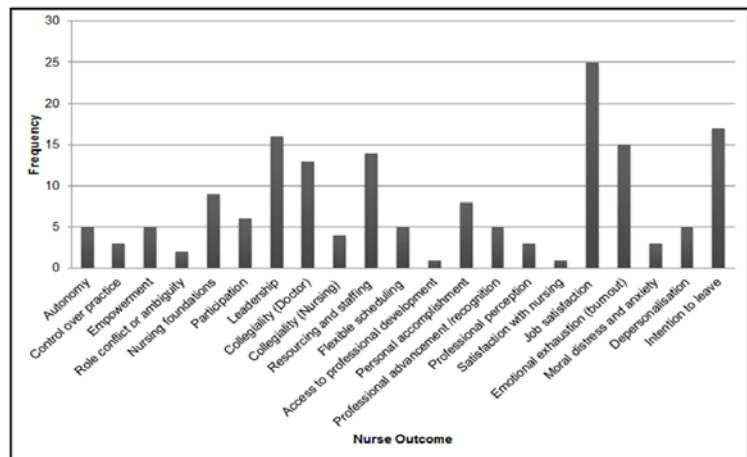


Figure 3. Repeatability of nurse outcome measures

3.1.1 Job satisfaction

Job satisfaction was strongly associated with the work environment in twenty five studies, including seven in ICU, with particular influence on intention to leave ($\bar{x} = -4.25$; $SD\ 1.61$; $p < .01$) [50] and ($\beta = -0.28$; $p < .001$) [51]. A study of 935 ICU nurses identified a positive association between job satisfaction and nurse leadership ($r = 0.612$; $p < .001$), nurse-physician collegiality ($r = 0.454$; $p < .001$), staffing and resource adequacy ($r = 0.328$; $p < .001$), participation ($r = 0.307$; $p < .001$), foundations for quality care ($r = 0.437$; $p < .001$) and professional advancement ($r = 0.595$; $p < .001$) [52]. Job satisfaction was also found to have a significant correlation with increased autonomy ($r = 0.331$; $p < .001$) in a study of 431 ICU nurses [53].

3.1.2 Intention to leave

Seventeen studies, four in ICU, measured intention to leave. One large prospective study of 2323 ICU nurses found associations between intention to leave and professional status ($\bar{x} = 2.20$, $SE\ 0.08$; $p < .001$), nursing leadership ($\bar{x} = 2.24$, $SE\ 0.08$; $p < .001$), staffing and resource adequacy ($\bar{x} = 2.27$, $SE\ 0.06$; $p < .001$), nursing foundations ($\bar{x} = 2.34$, $SE\ 0.06$; $p < .001$), nurse-physician collegiality ($\bar{x} = 2.51$, $SE\ 0.06$; $p < .001$) and rostering flexibility ($\bar{x} = 2.48$, $SE\ 0.09$; $p < .001$) [3]. These associations were also found two ICU studies [48, 54] and five studies in acute care settings [42, 46, 51, 55, 56].

3.1.3 Leadership

Nursing leadership repeatedly demonstrated significant impact on job satisfaction, participation, retention and perceived professional status. Sixteen studies underscored the importance good nurse leadership with four studies conducted in ICU [3, 41, 57]. Stone *et al.* (2006) [3] identified that leadership in ICU was significantly associated with intention to leave ($\bar{x} = 2.28$, $SE\ 0.08$; $p < .001$) while Klopper *et al.* (2012) [57] found a moderately strong correlation between leadership and a positively perceived ICU workplace ($r = 0.612$; $p < .01$). The bulk of the studies were conducted in non-ICU acute care environments. A large Australian multicenter study of 1,559 nurses identified a significant association between good

clinical leadership and improved job satisfaction (OR 1.17; 95% CI 1.03-1.34; $p < .05$), and reduced intention to leave (OR 0.80; 95% CI 0.72-0.91; $p < .01$)^[49].

3.1.4 Emotional exhaustion

Emotional exhaustion was explored in fifteen studies, three in ICU^[50, 52, 54]. A significant association was consistently reported between the level of emotional exhaustion, or burn out, by nursing staff. The most frequently reported significant contributing factors to emotional exhaustion were staffing (OR 1.17, 95% CI 1.09-1.25; $p < .01$)^[44] and (OR 0.50, 95% CI 0.34-0.73; $p < .005$)^[54], sense of depersonalization ($r = -0.576$; $p < .01$)^[52] and professional perception of nurses (OR 0.76, 95% CI 0.70-0.82; $p < .001$)^[44]. A recent study concluded that emotional exhaustion is an important predictor of a broad range of nurse outcomes^[56].

3.1.5 Resourcing and staffing

Fourteen studies found a significant association between perception of adequate resourcing and the work environment, with four studies conducted in ICU^[3, 48, 52, 54]. A moderately strong correlation was also found with job satisfaction ($r = 0.328$; $p < .01$), while intention to leave (OR 1.23; 95% CI 0.88-1.72) was not statistically significant^[57]. More broadly, in nine non-ICU studies, inadequate staffing and resourcing was associated with nurses having a negative perception of the work environment, including a large Australian study of 2,556 nurses ($t = -2.02$; $p = .04$)^[60].

3.1.6 Nurse-doctor collegiality

Effective Nurse-Doctor collegiality repeatedly influenced perception of the workplace environment. Thirteen studies found a significant association between Nurse-Doctor collaboration and nurse autonomy, emotional exhaustion and anxiety, job satisfaction and satisfaction with nursing generally, with five of these studies conducted in ICU^[3, 41, 46, 48, 52]. Of note is a study of 935 ICU nurses finding that Nurse-Doctor collegiality had a moderately strong correlation with job satisfaction ($r = 0.454$; $p < .01$)^[52]. Staff also expressed a higher sense autonomy ($r = 0.319$; $p < .001$)^[48], job satisfaction (OR 3.94; 95% CI 2.90-7.07; $p < .0001$)^[61] and ($r = 0.34$; $p < .001$)^[62], and nurse empowerment ($\beta = 0.27$; $p < .05$)^[26] when Nurse-Doctor collegiality was high. Conversely, a number of studies found increased intention to leave associated with low collegiality ($r = 0.11$; $p < .05$)^[42], (OR 2.26, 95% CI 1.23-4.14; $p < .05$)^[61] and ($\bar{x} = 2.51$, SE 0.06, $p < .001$)^[3].

3.1.7 Nursing foundations for quality care

High quality care, underpinned by a nursing foundation based on a defined nursing philosophy and nursing model of care, was found to be associated with a positive working environment in nine studies, three of which were conducted in ICU^[3, 41, 52]. Typically this was manifested by increased job satisfaction both in ICU ($r = 0.437$; $p < .01$)^[52] and in acute care areas (OR 1.26, 95% CI 1.09-1.45; $p < .01$)^[63].

3.1.8 Personal accomplishment

A perception of higher personal accomplishment was associated with a positive work environment in eight studies, one of which undertaken in ICU^[3]. Perceptions of high nurse autonomy ($r = 0.30$; $p < .01$)^[42] and professional respect ($r = 0.32$; $p < .05$)^[64], and increased job satisfaction ($r = 0.36$; $p < .001$)^[65] were evident when the sense of personal accomplishment was high. This positive association was also found where there was effective Nurse-Doctor collegiality ($\beta = 3.20$, SE 0.8; $p < .01$), strong leadership ($\beta = 3.10$, SE 1.1; $p < .01$) and organizational support ($\beta = 2.70$, SE 1.0; $p < .01$)^[61]. ICU nurses reported a higher intention to leave where they perceived a lack of personal accomplishment ($\bar{x} = 2.92$, SE 0.07; $p < .001$)^[3].

3.1.9 Nurse participation

Increased participation in hospital affairs was associated with a positive work environment in six studies, with two conducted in ICU^[41, 52]. Job satisfaction increased with higher participation ($r = 0.307$; $p < .01$)^[52], (OR 1.16; 95% CI 1.03-1.31; $p < .05$)^[63] and ($r = 0.36$; $p < .001$)^[65]. Hospitals achieving magnet status typically have higher rates of participation ($t = 4.68$; $p < .01$)^[60] and ($\bar{x} = 2.76$, SD 0.44; $p < .001$)^[66].

3.1.10 Depersonalization

The perception of being depersonalized from the work environment was identified as a strong predictor of emotional exhaustion and job satisfaction in three acute care studies^[42, 47, 56] and two in ICU^[43, 52]. Perceived depersonalization had a moderate inverse association with reduced job satisfaction in a study of 129 ICU nurses ($r = -0.313$; $p < .001$)^[43].

3.1.11 Professional recognition

Five studies consistently identified perceived professional recognition as a key nurse outcome, with one study conducted in ICU^[52]. Professional recognition was found to increase nurses' job satisfaction in ICU ($r = 0.595$; $p < .01$)^[52] and in acute care areas (OR 1.47; 95%CI 2.90-7.07; $p < .01$)^[63] and ($r = 0.25$; $p < .001$)^[65]. Professional recognition positively influences the perception of professional respect ($r = 0.24$; $p < .05$)^[64].

3.1.12 Nurse autonomy

Perceived autonomy was found to be an important a nurse outcome measure in five studies, with two specific to ICU^[48, 53]. In the largest prospective study of 431 ICU nurses increased job satisfaction had a moderate correlation with increased autonomy ($r = 0.331$; $p < .001$)^[53] which was supported in a later study ($r = 0.369$; $p < .001$)^[48]. ICU nurses also perceived higher autonomy when there was effective Nurse-Doctor collegiality ($r = 0.319$; $p < .001$), access to staff development ($r = 0.369$; $p < .001$) and perceived professional recognition ($r = 0.211$; $p = .001$)^[48] and ($r = 0.31$; $p < .05$)^[64]. Higher levels of emotional exhaustion ($r = 0.37$; $p < .01$) and perceived depersonalization ($r = 0.18$; $p < .05$) were associated with reduced autonomy as was low self-accomplishment ($r = 0.30$; $p < .01$)^[42]. Intention to leave was also influenced by lower perceived autonomy ($r = -0.142$; $p = .03$)^[48].

3.1.13 Nurse empowerment

A perception of increased empowerment was associated with a positive work environment in five studies conducted in acute care areas. Where nurses perceived increased empowerment job satisfaction was increased ($r = 0.39$; $p < .001$)^[67], ($r = 0.56$; $p = .01$)^[68], ($\beta = 0.22$; $p < .05$)^[26] and ($r = -0.11$; $p < .01$)^[65]. Empowerment increased with professional respect ($r = 0.39$; $p < .001$)^[64] and effective Nurse-Doctor collegiality ($\beta = 0.27$; $p < .05$)^[26], and was low when intention to leave was expressed ($r = -0.31$; $p = .01$)^[68].

3.1.14 Flexible rostering

Five studies identified flexible rostering as a determinant of a positive work environment, two of which were conducted in ICU^[3, 52]. Rostering inflexibility increases emotional exhaustion ($r = -0.325$; $p < .01$)^[52] and intention to leave ($\bar{x} = 2.48$, SE 0.09, $p < .001$)^[3]. Organizational climate is rated higher ($\bar{x} = 4.2$ vs. 3.8; $p < .001$)^[69] and job satisfaction increases with flexible rostering (OR 1.16; 95%CI 1.02-1.30; $p < .05$)^[63].

3.1.15 Nurse-nurse communication

Four studies investigated nurse-nurse communication in the workplace, with two conducted in ICU^[41, 46]. Improved communication attributed to introducing formalized ICU nursing rounds improved perceptions of the workplace ($\bar{x} = 4.85$ vs. post $\bar{x} = 5.36$; $p = .002$)^[41], while poor communication decreased job satisfaction ($\beta = -0.097$; $p = .04$) and compounded self-rated anxiety ($r = -0.160$; $p = .001$)^[46]. The organizational climate benefited from improved nursing communication ($\bar{x} = 3.8$ vs. $\bar{x} = 3.3$; $p < .001$)^[57] and interestingly the higher the number of ICU beds the lower the rating of effective nurse communication ($r = -0.152$; $p = .002$)^[46]. This might be postulated to be associated with a large nursing workforce and depersonalization in larger ICUs. Further to this observation, though not statistically significant, was an increased intention to leave in larger capacity ICUs (OR 1.21; 95% CI 0.78-1.88; $p < .05$)^[3].

3.1.16 Nurse outcome measures with limited supporting evidence

Three nurse outcome measures were identified that were supported by three studies or less. These outcomes, however, are consistent with recommended professional standards for healthy work environments and merit consideration^[70]. Increased control over practice is associated with greater autonomy ($r = 0.159$; $p = .005$)^[48] and where an inability to control practice

exists this is associated with increased intention to leave ($r = -0.22$; $p < .05$)^[42]. Moral distress was also found to increase where poor Nurse-Doctor collegiality existed ($r = -0.337$; $p < .001$) and with increased intention to leave ($r = 0.229$; $p = .01$)^[48].

3.1.17 Conclusion

Twenty one nurse outcomes in acute and intensive care work environment were identified and evaluated using the following steps: (1) assessing the quality of the relevant primary study and generating a quality index score; (2) assessing the risk of bias for each primary study; (3) examining the significance of the association between nurse outcome measures and structural features of the workplace environment; and (4) evaluating the repeatability and consistency of nurse outcome measures. Following this process all twenty one nurse outcome measures were retained to inform selection of a nurse survey instrument for ICU.

4 Discussion and instrument selection

Internationally, professional nursing associations recommend standards for healthy work environments that promote the balance of an organization's objectives with favorable nurse outcomes^[71, 72]. Where this balance is achieved magnet health care organizations evolve characterized by high quality nursing care, increased job satisfaction and improved nurse outcomes^[66, 73, 74].

Magnet organizations value nursing practice, workplace culture and climate, as well as material factors such as rates of pay^[74-76]. Strong leadership is a key factor and is considered to influence job satisfaction, participation levels, staff retention and perceived professional status^[77-79].

Healthy work environments recognize strong nursing foundations, active staff participation, empowerment and team building as a basis for high quality care^[80, 81]. An effective ICU clinical team is further underpinned by a high level of Nurse-Doctor collegiality to sustain a positive organizational culture and climate^[82-84].

Dissatisfaction and worsening staff outcomes are associated with health service restructuring aimed at improving productivity through work intensification^[85-87]. Staff outcomes are also influenced by rostering, poor physician-nurse interactions, new technology, staff shortages, unpredictable work flow, lack of control over practice and a perception that patient care is not coordinated, evidence-based or unsafe^[39, 48, 49].

Job satisfaction is associated consistently with positive work environment characteristics including nurse autonomy, staffing and resourcing, opportunities for professional advancement and positive acknowledgement^[32]. Intention to leave is reduced and job satisfaction is high where staff perceive they have equitable rosters, flexibility and control over personal time^[16, 88].

Structural and psycho-sociological factors determine nurse outcomes making it essential that both are appropriately captured in organizational survey instruments. High interdependence exists between organizational, interpersonal and individual behavior determinants of a health work environment^[86].

Perceptions held by nurses on how structural factors impact on them personally and may be manifested as emotional exhaustion^[16]. Emotional exhaustion refers to the depletion of aroused emotional states, such as a nurse feeling too emotionally drained to adequately care for patients. Combined with a sense of low personal accomplishment and depersonalization then these perceptions are manifested as 'burn-out' and increased intention to leave^[89].

Lack of personal accomplishment is linked to an individual's lower perception of self-competence and empowerment^[90]. Empowerment is an important component of transformational leadership and the trust underpinning staff autonomy and

job satisfaction^[91]. Effective communication supports control over practice, decision-making at the bedside and teamwork, all determinants of a positive workplace and ultimately a positive work environment^[48, 92].

Nurse outcomes reflect external structural factors and individual perceptions both of which are influenced by the work environment as recognized in professional standards and magnet hospitals^[70, 74, 93]. The most appropriate survey instrument should capture the impact of structural factors and individual perceptions and thereby align closely with the nurse outcome dataset identified.

Repeated testing of instruments over time in similar nurse populations provides an indication of their reproducibility and reliability. Taking into account the level of instrument congruence with the nurse outcome dataset, evidence of content and contextual validity and the frequency of testing across acute care settings including ICU (see Figure 4) enabled the selection of three survey instruments for further psychometric assessment.

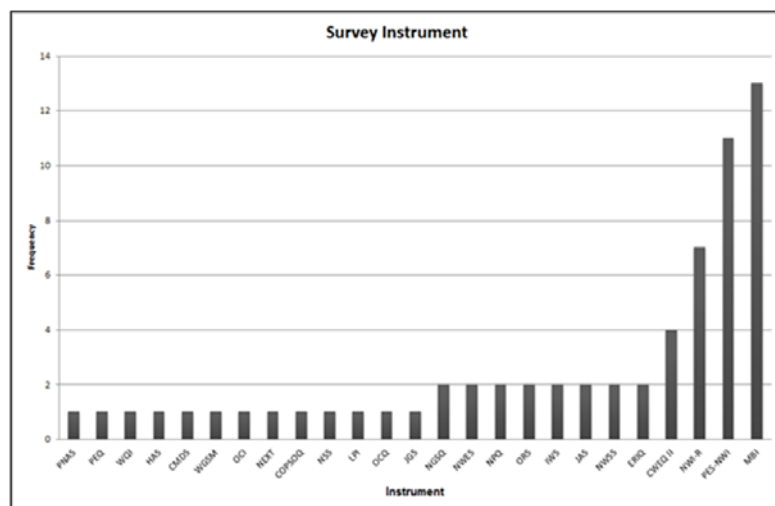


Figure 4. Survey instrument frequency of use

The Nurse Work Index-Revised (NWI-R)^[94], Practice Environment Scale-Nurse Work Index (PES-NWI)^[95] and Maslach's Burnout Inventory (MBI)^[96] demonstrated highest congruence and repeated testing warranting further psychometric validation.

Critical appraisal of the psychometric properties and predictive validity, of nurse survey instruments, is well established^[97-99]. Each survey instrument selected has undergone this process in a broad range of acute healthcare environments internationally including Australia^[100], Brazil^[42], China^[101], Japan^[102], Spain^[103], the United Kingdom^[31], United States^[104] and multi-nationally^[105]. A summary of the psychometric assessment for the NWI-R, PES-NWI and MBI is provided in Table 2.

All three survey instruments were tested repeatedly in multicenter studies involving large samples of nurses. Similarly, all instruments had been tested in acute care and ICU environments with PES-NWI being used more frequently in ICU. The content validity of the NWI-R and PES-NWI has direct relevance to the climate and culture of nurses' work environment.

The MBI focused on interpersonal and psychosocial aspects, with some relevance to organizational, factors but with a greater emphasis on individual perceptions and emotions. All three instruments have an acceptable level of reliability, with the Cronbach alpha mean composite coefficient for all studies being above 0.7, which is recommended as the minimum threshold to establish reliability^[106].

Congruence with the nurse outcome measures was high for both the NWI-R (aligned with sixteen outcomes) and the PES-NWI (aligned with seventeen outcomes). The MBI fulfills six of the nurse outcome measures: level of participation,

job satisfaction, emotional exhaustion (burnout), moral distress and anxiety, and depersonalization. Four outcomes captured by the MBI are not captured by the NWI-R and PES-NWI providing the justification to add subscales from the MBI to the nurse survey instrument selected.

Table 2. Survey instrument validity and congruence with nurse outcomes

Quality and Validity Factors	Survey Instrument		
	NWI-R	PES-NWI	MBI
Frequency	7	11	13
Testing repeated	Yes (multicentre)	Yes (multicentre)	Yes (multicentre)
Large study population	Range 155 to 2,287	Range 67 to 98,116	Range 155 to 98,116
Tested in nursing populations	Yes	Yes	Yes
Conducted in ICU	2/7	4/11	3/13
Organizational content validity	Yes	Yes	Yes (interpersonal focus)
Cronbach alpha: mean composite coefficient	α 85	α 81	α 82
Congruence with Nurse Outcomes			
Nurse Outcome	Measured		
Autonomy	Yes	Yes	No
Control over practice	Yes	Yes	No
Empowerment	Yes	Yes	No
Role conflict or ambiguity	Yes	Yes	No
Nursing foundations	Yes	Yes	No
Participation	Yes	Yes	Optional questions
Leadership	Yes	Yes	No
Collegiality (Doctor)	Yes	Yes	No
Collegiality (Nursing)	Yes	Yes	No
Resourcing and staffing	Yes	Yes	No
Flexible scheduling	Yes	Yes	No
Access to professional development	Yes	Yes	No
Personal accomplishment	Yes	Yes	Yes
Professional advancement /recognition	Yes	Yes	No
Professional perception	Yes	Yes	No
Satisfaction with nursing	No	Yes	No
Job satisfaction	No	No	Yes
Emotional exhaustion (burnout)	No	No	Yes
Moral distress and anxiety	No	No	Yes
Depersonalisation	No	No	Yes
Intention to leave	Yes	Yes	Yes

Higher congruence with the identified nurse outcomes, demonstrated content and construct validity, an ability to discriminate positive work environment characteristics, repeated testing and strong psychometric properties supports selection of the PES-NWI as the preferred survey instrument.

The PES-NWI seeks to elicit information from staff regarding their felt experience and perceptions^[100, 107, 108]. Factor analysis of data from magnet hospitals involving statistical testing of observed variables to determine correlation, internal consistency, reliability and validity across organizational domains, including ICU, was used to develop the PES-NWI^[108]. A large number of studies and industry reports published since 2002 describe the use, modification, and scoring variations of the PES-NWI in five different countries, translated to three languages, across ten practice settings^[101, 103]. In a recent

Australian study by Parker *et al.* (2010)^[100], the construct validity and reliability of the PES-NWI was tested in a random sample of 3,000 nurses working in private and public sectors demonstrating strong internal consistency with a Cronbach alpha of 0.948. The study concluded that the PES-NWI is a reliable survey instrument for a range of clinical settings with ongoing refinement and testing based on large nursing populations underpinning its construct validity and reliability for the assessment of nurses work environment in acute care and ICU settings.

4.1 Limitations

This review provides an overview of nurse outcomes found to reflect structural factors within an organization and uses this outcome profile to select an appropriate survey instrument. Although a variety of study designs were included in the literature search, the studies included in the analysis were primarily cross sectional and therefore the ability to confer causality is significantly limited. Studies undertaken across a broad range of countries were included, however, only those studies published in English were reviewed which may limit generalization of any findings. Terminology for similar nurse outcomes varied widely requiring interpretation for classification purposes. Lastly, this literature review had a broad international perspective but does not account for variability in different health systems. These limitations may lead restrict the generalization of the findings of this review without further contextual validation.

4.2 Implications for nursing management

This integrative review identifies the key constructs of a survey instrument that will assist policy makers and managers to better understand the factors contributing to a sustainable intensive care nurse workforce in the face of organizational change.

5 Conclusion

This literature review progressed through several stages of analysis to identify the most effective survey instrument to evaluate the working environment of nurses in ICU. The impact of structural factors on the work environment can be assessed by the nurse outcome measures captured within the PES-NWI survey instrument. The addition of the MBI is recommended to capture individual emotional responses. An instrument that incorporates both the PES-NWI and MBI subscales is most appropriate to evaluate the environment of nurses working in ICUs world-wide.

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