Nursing Workload and its Relationship to Patient Care Error in the Paediatric Critical Care Setting: An Observational Study

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Background

Patient care error:

- leading cause of death & disability in the critical care setting
- contributes to suffering
- can precipitate an emotional crisis for healthcare staff
- increased financial burden to the health care system
- increased nursing workload may contribute to negative patient outcomes

Objective

To examine the relationship between nursing workload and the delivery of best-practice care in the paediatric critical care setting.

Method

- prospective observational study nested within a larger study
- main outcome - 13 complications of care (identified as patient care error) resulting in an increased length of stay, pain, anxiety, discomfort or loss of trust
- direct observation of patients admitted to the PICU over a period of 5 months
- daily nursing workload scores (GRASP®) quantifying physical and emotional care determined
- using a correlational design, the presence or absence of patient care error was compared to the workload score for the nurse(s) over a 24 hour period
- descriptive statistics summarize the workload and error data
- Mann-Whitney U test to measure the significance of the differences
- Spearman correlation (Kendall's tau) to measure strength of the association
- logistic regression was used to evaluate the relationship between errors and workload

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Findings

- 2,117 patient days
- 3,845 nursing shifts
- 165 registered nurses
- 665 errors on 497 (23.5%) patient days
- 126 patient days had >1 error (up to 5)
- difference in mean workload hours between error and no error - 1.77 hours over 24 or approx. 53 minutes in a 12 hour shift
- Mann-Whitney U test – difference statistically significant ($p < .001$) - Glass rank biserial correlation = +.15 (small effect)
- Kendall's tau (.091) - Spearman's rho (.111) small effect also showing as statistically significant - p values < .001
- Wald criterion demonstrated workload made a statistically significant contribution to prediction ($p < .001$) - if workload is raised by .025 hours, the odds ratio is 1.025 times as large, and therefore 1.025 more times likely to produce an error
- approx. 50% of patients required nursing care in excess of what was suggested that one nurse could provide (8-18 workload hrs in 24)

Categories of Patient Care Error

Category of Error	*n*	% of total
Unplanned extubation	18	2.7
Unplanned removal of CV or arterial line	35	5.3
Patient injury	46	7
Adverse drug reaction	92	13.8
Unplanned return to the OR	3	0.5
Patient complication that is not a natural progression of the disease (MI, CVA, PE, etc.)	27	4.1
Unplanned readmission within 7 days	2	0.3
Development of neurological deficit	3	0.5
Unexpected death	0	0
Cardiac/respiratory arrest	11	1.7
ICU acquired infection	48	7.2
Dissatisfaction with care (documented)	33	5
Any other undesirable outcome not covered above	347	52.2
Total	665	100

Nursing Workload in Hours

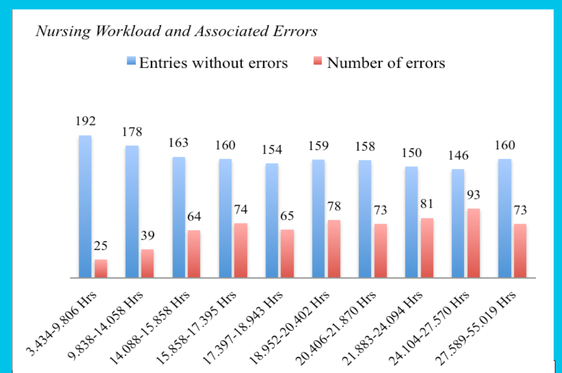
Statistics	Total	Errors	
		No	Yes
n	2117	1620	497
M	19.144	18.728	20.500
Median	18.952	18.569	19.915
Percentiles - 25	14.955	14.473	16.613
- 50	18.952	18.569	19.914
- 75	22.827	22.513	23.824

Note. Statistics are for nursing workload for a period of 24 hours representing two 12-hour shifts. Hours include all patients that the nurse cared for during the shift, including any care required of additional patients assigned.

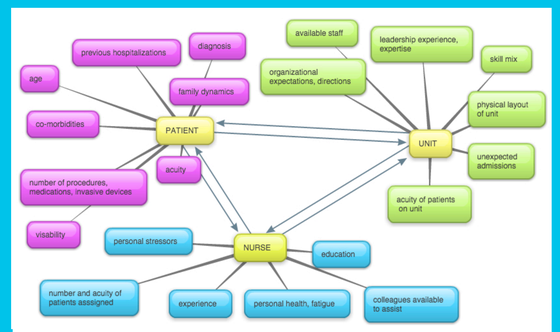
Correlations Between Nursing Workload and Patient Care Error

			Nursing Workload	Entries with Errors	Number of Errors
Kendall's tau_b					
	Nursing Workload	Correlation Coefficient	1.000	.091**	.091**
		Sig. (2-tailed)	.	.000	.000
		N	2117	2117	2117
Spearman's rho					
	Nursing Workload	Correlation Coefficient	1.000	.111**	.114**
		Sig. (2-tailed)	.	.000	.000
		N	2117	2117	2117

Note. Nursing workload is for a period of 24 hours representing two 12-hour shifts. Number of errors is from zero to five per 24-hour period. **Correlation is significant at the 0.01 level (2-tailed).



Note. Nursing workload was grouped by hours (24 hour periods) from the 10th percentile through to the 100th percentile.



Note. A condensed overview of the complex adaptive systems within an intensive care unit with possible influencing variables. Adapted from "Critical Care Nursing: Embedded Complex Systems," by R. Trinier, L. Liske, and V. Nenadovic, 2016, *Canadian Journal of Critical Care Nursing, 27*(1), p. 13. Copyright 2016 by the Canadian Association of Critical Care Nurses. Reprinted with permission.

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Limitations

- single centre
- error may result from care prior to the observation period or in an area other than PICU
- nursing workload tools remain controversial
- patient acuity, co-morbidities, nurse fatigue, stress, working hours, nursing experience, skill mix, physical environment, interruptions, multitasking, use of concentrated solutions, recent exposure to tasks and available assistance may influence error
- assistance from additional nursing staff (clinical support, colleagues) not captured

Conclusion & Implications

- association between nursing workload and patient care error was statistically significant
- increasing workload was associated with increased risk of error
- wide variation in workload scores (between 3.43 – 55.019 hrs in 24)
- 50% of patients required nursing care hours in excess of 18 (suggested practical workload), implying that multitasking, priority setting, leaving work undone or depending on support from colleagues was necessary to provide patient care
- the inability to provide adequate care has been shown to increase nursing stress (Halvorsen, Forde, & Nortvedt, 2008; Vryonides, Papastavrou, Charalambous, Andreou, & Merkouris, 2015), which has a negative effect on staff illness (Donovan, Doody, & Lyons, 2013) and retention (Rushton, Batcheller, Schroeder, & Donohue, 2015)
- understanding the complexity of the critical care environment and the implications of workload as a contributing factor to patient care error can provide insight into its prevention
- further discussion may encourage organizational change and innovative strategies to assess staffing requirements and workload assignments. These changes will potentially benefit patients, their families, nurses, and the health care system.