Analysis of Nurse Dependency of Burn Patients Using a Burn Injury Database (iBID)

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Aim: To analyse the nurse dependency data in the International Burn Injury Database (iBID) to explore how it can be used to inform workload measurement and quality of care.

Literature review: There is a plethora of different dependency tools designed for different care settings. Yet despite the importance of adequate staffing highlighted in the literature and standards related to staffing in the Burn Care Standards,¹ only four relevant tools were found that mention burns.^{2,3,4,5} None had been evaluated for burn care in the UK nor did they match the dependency criteria used in iBID. The Safer Nursing Care Tool⁶ is the most widely used tool in UK which, although it is endorsed in England by NICE⁷, is not specific to burn care.

Methodology: Data has been collected in iBID since 2007 from burn services in England and Wales. It now contains 200,038 individual patient records and 321,259 dependency records. A sample of 5,000 patients, with 24980 dependency records, was used for this initial statistical analysis to explore the degree of association and prediction between the variables relating to burn severity and nursing activities. A classification model was built in R using glmnet and the multinomial logistic family. The algorithm uses cross validation to determine the optimal model. The models have been post-processed to highlight the probability of each output class given the relevant input parameter space.

Ibid Nurse Dependency Variables Used For Calculating Burn Nurse Dependency Score				
Monitoring Requirement	Procedure Complexity	Psychosocial Support	Mobility Limitation	Activities Of Daily Living Achievement
B1 Surgical Ward	P0 no dressing or procedure	S1 ward round contact/social	L1 fully mobile	D1 self caring/minimal input
B2 High dependency	P1 simple small dressing <5% or ROS	S2 explanatory chat	L2 some limitation supervision/ assistance needed	D2 minimally dep assistance few tasks
B3 Intensive care	P2 single body segment dressing 5-10%	S3 significant support needed	L3 significant limitation needing 1-2 assistants & walking aid	D3 limited function assistance with some tasks
B4 Additional Intensive care	P3 mod dressing 10-20% / small op	S4 in depth discussion or NOK support	L4 severe limitation hoist / tilting table / standing frame	D4 severely limited assistance with most tasks
B5 complex intensive care	P4 mult seg dressing >20% / signif op	S5 intense observation or NOK in crisis	L5 totally immobile high pressure sore risk hoist only	D5 fully dependant assistance with all tasks
	P5 near full dressing / major op

Results

- The average nurse dependency total score per patient increases with percentage burn. (Figure 1).
- Although the ward dependency total scores tend to be at the lower dependency end and ICU scores at the higher dependency end, with HDU in the middle, the full range of dependency totals (4-25) can be seen in all locations. (Figure 2).
- Nurse dependency total scores for patients with no inhalation injury is likely to be below 13. Whereas if there is an inhalation injury the dependency total is likely to vary across the whole range of dependency scores during their hospital stay. (Figure 3).
- Adults are twice as likely to require intense psychosocial support (S5) than children or the elderly. (Figure 4).
- Figures 5 and 6 show the probability of each level of the dependency variable (activities of daily living achievement / procedure complexity) occurring in each location. There is no uniform pattern across the areas. The middle levels of the variables (L4 and P3) tend to be used similarly across all the locations, suggesting that the middle levels may not have a significant affect on the model.
- For all locations there is likely to be a 30% chance that no dressing will be required. This may be because the dressings are not always performed each day, nor on every shift. (figure 6).

Conclusion

Concerns over balancing nurse staffing levels with patient acuity is not a new phenomenon yet there continues to be difficulty in quantifying workload and the subsequent number of staff required for good patient outcomes. The results to date show that there is a complex relationship between the nursing workload measurements and burn variables. However these preliminary results do suggest that a predictive model of burn workload is possible using the iBID variables but further analysis is required. Additionally the iBID nurse dependency variables need to be compared to a validated dependency tool, which is the plan for the next stage of this research.

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