Title: A RECOVERY NURSING-CARE ALLOCATION ALGORITHM

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Introduction. The proper degree of recovery-room nursing care is a perennial problem for the recovery room nursing administrator. Much has been written concerning intensive care nursing allocation, but there has been no focus on the specific problems of optimal nursing allocation in the recovery room. At our institution we have used a 4-group classification scheme based on the number of nurses assigned by the nursing administrator: Group 1--2 patients to 1 nurse, Group 2--1 1/2 patients to 1 nurse, Group 3--1 patient to one nurse, and Group 4--1 patient to 2 nurses. The purpose of this study was to examine this classification system for usefulness and, with discriminant analysis, to classify the patients based on a minimum number of objective parameters available on admission to the recovery room.

Methods. After clearance from the Human Subjects Committee and waiver of any need for informed consent, a survey of recovery room admissions was undertaken. Data recorded included sex, age, weight, height, ASA physical status, number of peripheral IV's, number of calibrated drips, presence of central IV, endotracheal tube, drains, arterial line, Swan-Ganz pulmonary artery catheter and ventilator. Also, patients were classified as OR or non-OR (pain, ECT, lines). Air was classified as (1) clear, (2) oral/nasal, (3) manual support, (4) intubated, or (5) tracheostomy. Finally, nursing allocation classification as defined by the nursing administrator was also recorded. Stepwise discriminant analysis was used to identify that subset of the above variables which would maximally discriminate among the nursing allocation groups. Rao's V^2, a generalized distance measure, was used as the discrimination criterion and significance for variable entry into the equation was defined at p<0.05.

Results. Over a period of two months, 529 consecutive admissions to the recovery room were surveyed, 302 females, 227 males. Age ranged from less than a year to 96 yrs with mean ± SEM of 41.7±1.0 yrs. ASA physical status classifications were I (42%), II (32%), III (17%), IV (2%), V (<1%), and 11% of the admissions were emergencies. Average weight was 66.4 kg, average height 164 cm. OR admissions comprised 89% of admissions; non-OR admissions (pain, lines, ECT) made up the remaining 11%. Airways were classified as clear (60%), oral/nasal (24%), requiring manual support (3%), intubated (11%), and tracheostomy (2%). Mean number of peripheral IV's was 1.10±0.02 (SEM) and 11% of patients had at least one central line. Sixteen percent had drains, 10% had arterial lines, 2% required ventilators, and 1% had Swan-Ganz pulmonary artery catheters in place. After application of discriminant analysis, two functions were derived: one discriminated Group 1 from the rest, one discriminated Group 4 from the rest. Groups 2 and 3 were not discriminated from one another by the nursing activities recorded. Therefore, we merged groups 2 and 3, and repeated the analysis, adding into the discriminant function at each step that variable which would help most to discriminate among the three groups. With this procedure, six of the 14 variables were selected as discriminators: (1) origin of patient, OR (OR=1, non OR=0), (2) presence of ET tube, TUBE (yes=1, no=0), (3) presence of central line, CENT (yes=1, no=0), (4) presence of A-line, ALN (yes=1, no=0), (5) presence of ventilator, VENT (yes=1, no=0), and (6) ASA physical status, ASA (1-5).

The following two discriminant functions were derived, with each variable entering the functions at p<0.05 and total significance of the functions at p<0.001:

Function 1 = -2.1+OR-0.8*TUBE-1.0*CENT-3.6*ALN -1.5*VENT-0.3*ASA + 3.1
Function 2 = -7.8+OR+0.1*TUBE+0.3*CENT+1.1*ALN -0.6*VENT + 7.4

These two functions can be used to classify patients as diagrammed in the figure, by the discriminant analysis package on SPSS. With this system, 93.1% of cases are correctly classified.

Conclusions. A quantitative algorithm has been developed to allocate number of nurses needed to care for each patient as the patient arrives in the recovery room. Using only the six variables noted, 93.1% of patients are correctly classified. This may be easily done by hand (since all variables except ASA take on 0 or 1 as a value), and the chart in the figure can be used. Alternatively, a programmable calculator can be used to input the values of the six discriminant variables for each patient and receive as output the proper group classification for nursing allocation.

References.