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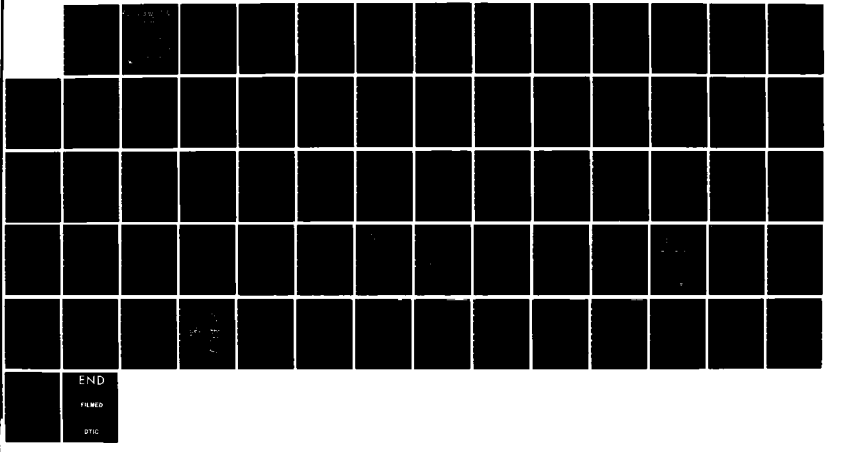

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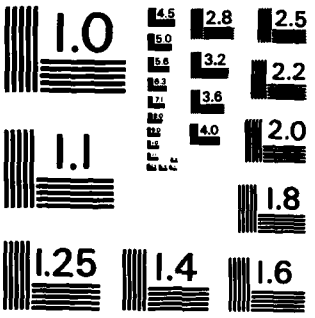

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AN EVALUATIVE STUDY OF THE NAVY MEDICAL DEPARTMENT'S PATIENT CLASSIFICATION SYSTEM AND STAFFING ALLOCATION

Preliminary Report

CDR Karen A. Rieder, NC, USN
LCDR Susan Jackson, NC, USNR-R

Research Paper 1-84
August 1984

Research Department
Naval School of Health Sciences
Bethesda, Maryland 20814-5033

AN EVALUATIVE STUDY OF THE NAVY MEDICAL DEPARTMENT'S PATIENT CLASSIFICATION SYSTEM AND STAFFING ALLOCATION

Preliminary Report

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AUTHORS

Commander Karen A. Rieder, NC, USN, is principal investigator and project director for this study. During the conduct of this study, CDR Rieder was Director, Research Department, Naval School of Health Sciences, Bethesda, Maryland.

Lieutenant Commander Susan Jackson conducted the study to meet the requirements of HSA 270: Research in Health Services Administration, under the direction of Dr. R. F. Southby, Ph.D., in partial fulfillment of the requirements for a Post-Masters Graduate Certificate in Health Services Administration from The George Washington University, Washington, DC.

An Evaluative Study of the Navy Medical Department's Patient Classification System and Staffing Allocation

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1. INTRODUCTION.

a. Purpose. The purpose of this study was to evaluate the validity and reliablity of the Workload Management System (WMS) for Nursing which has been under development since 1981. In addition, the perceptions of registered nurses regarding the usefulness of the system as a management tool were measured using written questionnaires. This technical report will present the background information for the study, including the hypotheses, literature review, and instruments utilized, and the results obtained during a site visit to the first test hospital, Naval Hospital (NH) Charleston. A final report will compare and analyze the findings from the six naval hospitals included in the study.

b. Background. The Workload Management System for Nursing was developed as part of a three year research project which examined the utility of a patient classification system as the basis for nurse staffing decisions within the Navy Medical Department. Initially undertaken at the request of the Navy Surgeon General,[1] the requirement for this system was reinforced by a mandate from the Joint Commission on the Accreditation of Hospitals.[2] JCAH Nursing Standard III states that departments of nursing shall define, implement, and maintain a system for determining patient requirements for nursing care on the basis of demonstrated patient needs, appropriate nursing intervention, and priority of care.

As a prelude to development, in 1980 a survey was mailed to 31 naval hospitals to ascertain whether or not patient classification systems were being used to determine staffing requirements. Of 28 respondents, twenty-one or 75 percent of the hospitals indicated that they were using some type of factor evaluative system to classify patients.[3] However, several problems were identified with the various classification tools. First, none of the tools had been tested for reliability to determine if comparable results were obtained by different users. Second, personnel training in use of the system often was inadequate which resulted in low user satisfaction. Third, some tools were very comprehensive encompassing several indicators of nursing care while other tools examined only a few indicators. Finally, the staffing requirement charts for each hospital varied significantly according to both the number and the mix of nursing personnel. In summary, there was no way to compare workload across naval hospitals due to the lack of a standardized system.

Based upon information from the survey, five patient classification systems were selected for comparative analysis. A panel of nurse experts, each experienced in using one system, was brought together to evaluate the five systems. During the study, each nurse classified patients using not only her own hospital's system but also each system developed by the other four hospitals. The criteria selected for evaluation of the systems were: the scope of use, inter-rater reliability, ease of use, and user acceptance.

Using the above criteria, one system was judged to be superior to the others. The Jacksonville System was found to have the highest inter-rater reliability (89.5 percent in 1,222 items), greatest ease of use, and the highest level of acceptance.[4] In addition, this system was more discriminating in that patients were grouped into five categories of nursing care, rather than three or four. Finally, the staffing requirement charts used in the Jacksonville system

were found to be at the median level for number and mix of personnel among the five systems. Guided by the findings of this study, the Director of the Navy Nurse Corps selected the Jacksonville patient classification system for standardization at all naval hospitals.

In January 1982 a refined workload management system was pre-tested at selected naval regional medical centers and distributed to the 34 hospitals during a pilot test. This system was developed for use on medical-surgical, neuro-surgical, orthopedics, post-partum, and multi-service wards. After months of trial testing, several problems were detected. Foremost was low user acceptance because the philosophy underlying the system was based upon the concept of minimal staffing to deliver patient care. The system had been designed to identify the minimum number of staff necessary to give "safe" versus an optimal number of staff to give "quality" care. Nurses in the field perceived that Washington did not understand the staffing requirements for good care and subsequently padded the scores to increase the staffing numbers. Other problems identified included: misinterpretation of critical indicators of care, complaints about weights (minutes of time) attached to each critical indicator, and questions concerning applicability of the system to special care areas.

Based upon feedback from the pilot test, the following changes were made:

1) The philosophy upon which the workload management system is based was changed from minimal staff to optimal staff for delivery of quality care.

2) The point value for each critical indicator was standardized using values obtained from mathematical time and motion studies.

3) The critical indicator list of direct care activities was streamlined to include only critical indicators having the greatest impact on nursing time. In addition, new critical indicators which pertained to specialty areas were added.

4) The categories of care were expanded from five to six levels so that the system could be used in critical care, nursery, and pediatric settings.

5) The nursing care hour requirement charts for determining the number and mix of nursing personnel were revised to account for:

   (a) direct and indirect nursing care activities,

   (b) teaching versus non-teaching hospital variations, and

   (c) type of unit variations: open, semi-private, nursery, or light care.

To standardize the point value for each critical indicator the Navy incorporated the results obtained in a Nursing Care Hour Standards Study (1981) completed by the Army. LTCOL Susan Sherrod, a nurse researcher at the Health Care Studies Division of the Academy of Health Sciences, Fort Sam Houston, Texas, conducted a four-year time and motion study during which 37,000 observations were made to derive mean times for 357 direct nursing care activities at nine hospitals for all levels of nursing staff.[5] The time measurements were utilized to determine the minimal essential mean tasking time for all specified direct nursing care activities. In addition, a methodology for determining care provider numbers and mix for various specialty areas was developed.

In adopting the time values, an assumption was made that direct nursing care time for specific activities in the Navy was the same as direct care time in the Army. This assumption was tested by actually timing certain selected activities and found to be valid. The Sherrod study has been cited as having the most comprehensive and best documented task list to be found anywhere in nursing literature.[6] For these reasons, the Navy has a high level of confidence in the point values assigned to each critical indicator of direct care.

After incorporating all of the recommendations, a revised Workload Management System was implemented in January 1983. Although feedback indicated greater user satisfaction, there were still variances in how patients in homogeneous groups i.e., newborns, were classified. It was hypothesized that

the classification tool was not being used reliably due to confusion about the definitions of critical indicator terms and insufficient guidelines for implementing the system.

To validate these impressions, on-site studies were conducted at two large naval hospitals during April-May 1983. The purpose of the visits was to assess the reliability and validity of this revised Workload Management System. Findings from the visits revealed inconsistencies in patient classification and confusion regarding proper implementation and monitoring of the system.[7]

Corrective action was taken to further revise the critical indicator list, to operationally define the critical indicator terms, and to develop a standardized teaching workbook. In July 1983, a three-day workshop was held for the Workload Management Coordinators from all CONUS naval hospitals to discuss implementation problems, to disseminate materials, and to devise a mechanism for monitoring system reliability. As a result of the workshop, a revised Critical Indicator Instrument for classifying patients was developed. For the first time, a Workload Management System Educational Workbook to be used for personalized instruction or for inservice teaching was written and distributed to all naval hospitals. In this way the Workload Management System process and terminology were standardized in all hospitals.

By October 1983, most CONUS hospitals had incorporated the new Critical Indicator Instrument for classifying patients, had conducted training classes using the workbook for all nurses involved with the WMS, and had instituted monthly inter-rater reliability testing on nursing units. Out of CONUS hospitals implemented the new changes by January 1984. Figure 1 describes how the system is being utilized by all naval hospitals.

To complete the Workload Management System Project, an evaluative study was begun in February 1984 to assess its validity and reliability. The

DYNAMICS OF THE WORKLOAD MANAGEMENT SYSTEM

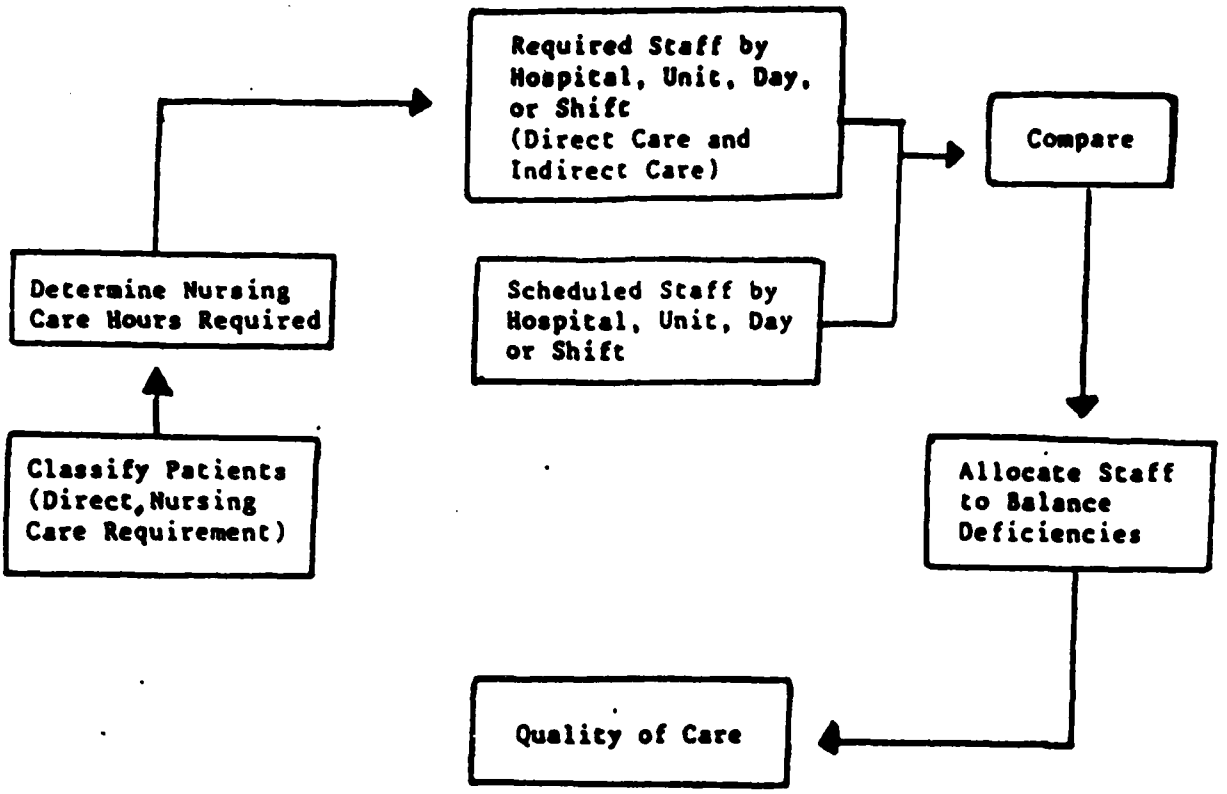

FIGURE 1

The flow chart above delineates how the Workload Management System operates. The process begins with the classification of patients into categories of care. The hours of nursing care required and the recommended number and mix of personnel needed to meet these requirements are then calculated based on the number of patients in each category. The actual number and mix of personnel assigned is then compared with the recommended staffing to determine if staffing levels are above, below, or within the recommendations. If staffing levels for the workload to be accomplished differ from recommended levels, staffing can be adjusted to balance the variation. The number and mix of nursing personnel available to provide patient care will significantly impact on the quality of care actually delivered.

preliminary results described in this report are based upon an on-site visit to Naval Hospital, Charleston, South Carolina. Over the next six months, additional on-site visits will be made to five other CONUS hospitals purposely selected based upon size. Inter-rater reliability was tested by comparing scores awarded by a nurse expert with scores assigned by the nurse classifying patients on the same nursing units. Other data was collected by administering questionnaires which measure charge nurses' perceptions of staffing adequacy and staff nurses' perceptions of direct and indirect nursing care given under various staffing patterns.

Throughout the Workload Management System Project, close collaboration has been maintained with the Army Nursing Research Department, Walter Reed Army Medical Center, Washington, DC. To check for construct validity, the Army has field tested the WMS at Army Military Treatment Facilities. In addition, the Army has recently completed a work sampling study of indirect nursing care at nine hospitals.[8] Results from this study will be valuable in determining whether or not the Navy Nursing Care Hour Requirement Charts need to be revised.

c. Merits.

The benefits to the Navy of a reliable Workload Management System are multiple. At the local hospital level, the information can be used to determine workload, to compare workload on different units, to adjust staff assignments, and to justify requests for additional numbers and skill level of nursing personnel. The Naval Medical Command could use the information for identifying the number of beds and units required in a new facility based on historical workload, for identifying seasonal trends in patient requirements at various facilities, and for determining the number and types of nursing personnel required for care of specified groups of patients under wartime scenarios. The Navy Military Personnel Command could utilize the data for equitably

distributing nursing billets among hospitals. This data could also be valuable as an addendum to the Uniform Staffing Methodology and Uniform Chart of Accounts materials from which measurement and justification of health care costs are determined.

2. REVIEW OF LITERATURE.

One of the most difficult problems facing directors of nursing service is the determination of nurse staff requirements. Traditionally, staffing needs were based upon daily inpatient census, and staffing standards were set on a ratio of hours of care per 24 hour patient day. For example, 3.5 hours of care per patient day may be used with staffing levels generally set high to ensure adequate coverage during peak loads.[9] Another major problem was the assumption that nursing care requirements would be the same for every patient. The result was a continuous inbalance of workload. Although supervisors made daily staffing reassignments based upon their judgment and expertise, these changes often were viewed as subjective and frequently resulted in charges of unfairness or favoritism. Therefore, studies were undertaken to find a more objective method for determining staffing requirements.

The earliest studies that could be found were undertaken by the National League of Nursing Education. These evolved from concern regarding the appropriate tasks and numbers of patients assigned per level of nursing personnel, the most efficient combination of staff, and the minimum number of staff to hire. In a 1947 study an initial attempt was made to base staffing numbers upon nursing care requirements of patients by rating pediatric patients on a three-point intensity scale using four factors: degree of illness, activity, adjustment, and the number and complexity of procedures and treatments.[10]

Wright in 1954 was among the first to utilize work study techniques developed by industrial engineers to quantify the amount of time required for specific nursing interventions.[11] A study which further demonstrated the need to match staffing to patient workload was done by Aydelotte and Tener in 1960. They found that when the numbers of nursing personnel on a unit were increased without a parallel increase in patient load, the staff did not redistribute their time to allow for more direct care to patients.[12] This finding has ramifications for "overstaffing" or placing more staff than is needed on a nursing unit.

One widely used technique for determining workload is a patient classification system (PCS). Under this method, staffing requirements are based upon the acuity levels of patients. A patient classification system refers to the "identification and classification of patients into care groups or categories, and to the quantification of these categories as a measure of the nursing effort required".[13] Abdellah and Levine have identified two types of patient classification systems. The first type, "prototype evaluation" matches patients to a standard profile or stereotype for each category. The second and most common type, "factor evaluation", utilizes critical indicators or descriptors of direct care requirements to individually rate the care required by each patient. Each factor earns a score which is then summed, and the total score determines a patient's category.[14]

The studies having the greatest impact on the modern patient classification system were conducted by R.J. Connor in the late 50's and early 60's at Johns Hopkins Hospital. He used work measurement techniques to identify elements of direct patient care. Patients were classified into three categories (self care, partial care, and total care) depending upon their nursing care requirements.

For each category, Connor developed an average number of nursing care hours per patient day which were based upon industrial time and motion measurements.[15] For the first time a patient classification system could be converted into a quantitative measurement of nursing workload. Although a milestone in objectively determining staffing needs, the research was limited because it only examined direct care requirements and not instructional, observational, and emotional needs of the patient nor nursing administrative duties. At this point in time, nursing was primarily seen as a task oriented occupation. Young (1962) was the first to include indirect nursing care. He defined indirect care as "all activities done away from the patient in preparation for completion of care, as well as those activities directed toward general unit management".[16]

Within the past twenty years, patient classification systems have not changed drastically but rather have been refined and tested for validity and reliability. Several commercial instruments have emerged such as CASH, TISS, MEDICUS, and GRASP which have been modified for use in multiple types of hospitals. In an attempt to provide nurse staff planners with a method for studying and estimating staffing needs, the U.S. Public Health Service, Division of Nursing, conducted an eight year study at San Joaquin General Hospital, Stockton, California. The study resulted in identifying procedures for work sampling, direct care sampling, patient classification, and measurements of perception of staff adequacy. The study also documented the relationship between patient classification and staff needs.[17] As a result, a standardized manual for evaluating a hospital's staffing requirements was developed. This manual was updated in 1983 to incorporate new measurement techniques after a follow-up study of the San Joaquin methodologies was conducted.[18]

Despite all of the development and research on patient classification

systems over the past thirty years, significant shortcomings still exist. Vaughan and MacLeod (1980) identify some of the problems as follows:

1) The studies generate far more data than are needed for practical application.

2) The scheme for classifying patients varies among hospitals.

3) Most classification schemes leave gray areas between classes within a hospital.

4) The workload analysis systems are generally too tailored to one institution.

5) Most systems cannot be easily updated when changes occur in methods, physical unit layout, equipment, or redistribution of certain activities to other departments.

6) Most systems have no means of verifying that the operational classifying of patients is being done accurately.[19]

Although Vaughan and McLeod support the idea of a standardized tool so that comparative analysis of one hospital's nursing staff efficiency can be made to other hospitals or national norm, other researchers disagree. Giovannetti (1979) stated that the qualification coefficients are not transferable. She asserted:

> "Average care times or standard times are not necessarily the same from institution to institution or even from one nursing unit to another. A multitude of factors affect the determination of care times, such as type of nursing organization, physical facilities design, treatment modalities, physician practices, availability of nursing skills, and attitudes of treatment personnel." [20]

Therefore, hospitals interested in using a patient classification system need to determine their own quantification or index of workload. This requires a modification of commercial systems to meet the needs of each hospital.

More recently, researchers have attempted to demonstrate a relationship between the nursing care hours per patient generated by a workload management system and the quality of patient care. Giovannetti (1979) believes that:

> "Patient classification systems can be extremely effective in matching workload generated by patients to numbers of nursing personnel. There is no evidence, however, that the effective utilization of nursing personnel hours has any direct relationship to the quality of care."[21]

One problem in determining quality is the overlap of functions performed by various levels of nursing personnel. A study by the Allied Health Professionals at UCLA found that 60 percent of all nursing functions were performed by all levels of nursing personnel - aide, LPN, and RN.[22] Therefore, a variety of personnel configurations may be used to meet patient care needs.

To specifically look at the quality of nursing care in relation to workload in the Navy Medical Department, Montgomery and Kelly utilized the Rush-Medicus quality instrument. Phase I of their research determined which of the 250 questions were indicative of quality care given on a particular shift. Of these questions, 140 were found to be relevant. In Phase II, staffing structures were identified. The analysis of Phase II data "failed to demonstrate a practical significant relationship between the quality of nursing care at naval hospitals and nursing personnel workload as measured either by the average daily difficulty of assignments or by the average hours per person required by staff members to care for patients."[23] A third phase of the research consisted of asking nursing supervisory personnel to select those quality questions on the questionnaire they believed most sensitive to changes in workload. Twenty-five questions were selected. Although there was a stronger correlation to workload changes, the results again were not significant. The authors concluded that the most vitally needed component for future quality workload studies is a valid quality monitoring methodology.[24] Unfortunately, a further review of the literature has failed to identify such an instrument.

Williams and Murphy (1979) attempted to measure staffing adequacy, patient care services provided under various staffing conditions, and charge

nurses' subjective judgment of both of these elements. The results showed that charge nurses' judgments of less than satisfactory staffing were strongly related to perceived declines in their ability to provide direct care services. They also found that when staffing was judged as inadequate, priority was given to activities of the medical plan while communications and observation of patients suffered.[25] These results cannot be generalized since the validity and reliability of the tools to measure these perceptions were not addressed in their study.

In conclusion, patient classification systems appear to be useful models for evaluating staffing adequacy and for determining long term staffing requirements. Yet, their utility is predicated upon the close attention given to developing various elements of the system. The critical indicators which best identify the appropriate category of care must be based upon observational studies, although there is considerable debate about the number and scope of the critical indicators. Giovannetti (1979) does not believe that the patient classification tool must provide a comprehensive assessment of patient needs. She thinks that it is sufficient to identify direct care requirements with minimal attention given to psychosocial and teaching needs. In fact, there are some tools with only four indicators that have been found to be valid.[26] Other model developers believe only a system that is inclusive of all the requirements of patient care is sufficient. This is based on the assumption that staff nurses using the instrument will not accept its credibility if direct and indirect care activities are not included. If not perceived as comprehensive, the instrument may not be used reliably.

Reliability and validity are key elements in any patient classification system. In order to ensure that nurses classify the same patient into the same

category of care, a reliability monitoring system requiring an 80 percent inter-rater reliability level must be established. Validity is a more difficult element to demonstrate and refers to the extent to which an instrument actually measures what it purports to measure. The content validity of most patient classification instruments has been determined by a panel of nurse experts. Construct validity has seldom been verified, and Giovannetti states that none of the present instruments have demonstated validity in terms of actual patient needs.[27]

3. DEFINITION OF TERMS.

Workload Management System for Nurses: a systematic process for determining staffing requirements based upon identified patient care needs. The system includes a patient classification tool and a staffing methodology. The patient classification instrument is of factor evaluative design and requires that a registered nurse assess ten factors related to direct patient care and assign a score to each factor. The assessment consists of both retrospective and prospective components; that is, assessment of care required during the day shift is used to predict care requirements for the next 24 hours. The weighted factor scores are summed resulting in the patient being classified into one of six discrete categories. The staffing methodology is used for determining the actual nursing care hour requirements for a specified group of patients, and the numbers and mix of personnel recommended to provide quality care. This system incorporates both direct and indirect care time.

Patient Classification: the grouping of patients according to an assessment of their nursing care requirements over a specified period of time.

Critical Indicators: those nursing activities on the patient classification instrument that have the greatest impact on direct care time.

Factors: a group of critical indicators that cover one specific domain of activities. They include nine areas: vital signs, monitoring, activities of daily living, feeding, treatments/procedures/medications, respiratory therapy, IV therapy, teaching/emotional support, and continuous care.

Points: the values assigned to each specific critical indicator based upon documented time and motion studies. Each point is equal to 7 1/2 minutes of direct nursing care time.

Category: the representative grouping of patients according to their nursing care requirements. The Workload Management System consists of six categories. A category I patient requires minimal care whereas a category VI patient requires intensive care.

Direct Nursing Care Time: the activities that take place in the presence of the patient and/or family. These activities are observable, behavioral, and include the following: placement of equipment at bedside, explanation of procedure to patient, preparation of patient, performance of treatment, removal of equipment from area, recording of treatment, assessment/observation of patient response, and teaching. These activities account for 35 to 45 percent of the total nursing care time.

Indirect Nursing Care Time: those activities, conditions, and circumstances that necessitate time over and above direct care. To address these factors, indirect care time and special allowances have been incorporated into the nursing care hour requirements for each of the six patient care categories. Indirect care time accounts for approximately 55 to 65 percent of the total nursing care time and is subdivided into the following four categories: indirect care - 30%, unpredicted needs - 15%, teaching hospital allowance - 10%, and semi-private room allowance - 20%.

Nursing Care Hour Requirements: the hours of nursing care time required for each category of patient based upon an assessment of their direct and indirect nursing care requirements. This is operationalized via six pre-calculated nursing care hour requirement charts which incorporate two factors: type of unit (open, semi-private room, nursery, or light care) and type of facility (teaching vs. non-teaching hospitals).

Personnel Requirements: the number and mix of RNs and NRNs required to care for the patient workload on a unit. This is operationalized via two charts: acute care and intensive care. The acute care chart allocates a 40% RN to 60% NRN personnel mix and distributes 45% of staff to the day shift, 35% to the evening shift, and 20% to the night shift. In contrast, the intensive care chart utilizes a 60% RN to 40% NRN personnel mix which is evenly distributed across all shifts.

RN: a professional Registered Nurse who has satisfactorily completed an orientation program to the hospital.

NRN: Nursing Service personnel other than RNs who have satisfactorily completed an orientation program to the hospital. This includes corpsmen, LPNs, and medical ward clerks.

Workload Index: the ratio of recommended staffing levels to assigned staffing levels as determined by the Workload Management System. An index of less than 1.0 indicates assigned staff exceeds recommended staff, reflecting overstaffing. An index of greater than 1.0 reflects understaffing; that is, assigned staff does not meet the recommended staffing level.

Trained Rater: a nurse who has undergone standardized training in use of the patient classification instrument.

Inter-Rater Reliability: level of agreement (in factors and in categories) achieved when two trained raters independently assess a group of patients on a specified unit during the same time period using the patient classification instrument. An 80% level is desirable.

Intra-Service Reliability: level of agreement in factors and in categories within each clinical service (medicine, surgery, orthopedics, nursery, ICU, CCU, post-partum) when trained raters independently classify patients using the patient classification instrument. An 80% level is desirable.

4. HYPOTHESES

In order to determine whether or not the Workload Management System (WMS) is a valid and reliable instrument for quantifying patient care needs and for establishing manpower requirements, the following hypotheses were tested:

a. The WMS will have high inter-rater reliability (percent agreement > 80%) plus Kappa significant at $p < .01$) for patient category using the classification at each test facility.

b. There will be high inter-rater reliability (intra-class correlation significant at $p < .01$) among a majority of the critical factors in the patient classification instrument.

c. Nurses will express greater acceptability/satisfaction with the WMS than dissatisfaction.

d. There will be a positive correlation between nursing staff numbers and mix (as determined by the WMS) and charge nurses' perceptions of staffing adequacy.

e. There will be a positive correlation between staff nurses' perceptions of the quality of direct and indirect care provided and the Workload Index which

indicates under (-) or over (+) staffing.

5. METHODOLOGY

a. Overview. Six study sites were selected to provide a representative mix of CONUS naval hospitals by size, geographic location, nursing unit configuration, and mission to population served. Additional criteria included the availability of up-to-date monthly nurse staffing summary information and reports of hospital inter-rater reliability testing for a minimum of four months. The Directors of Nursing Service at hospitals which met the criteria were consulted regarding their willingness to participate in the study. An official letter from the Commanding Officer, Naval School of Health Sciences, Bethesda, MD, was sent to the Commanding Officer of each selected hospital to request formal permission to make an on-site visit.

This technical report will present and discuss the findings of the study at the first test site, Naval Hospital Charleston. The procedure outlined was followed at all subsequent study sites.

b. Procedure.

(1) Prior to making the first on-site visit, the Nurse Expert established her inter-rater reliability by classifying patients at Walter Reed Army Medical Center with the Critical Indicators Instrument. The nurse expert's scores were compared to scores obtained by an Army Nurse Expert for the same patients. A 90 percent inter-rater reliability level was obtained on factor comparisons and 100 percent for categories.

(2) The data collection instruments (see Appendices A-E) were developed jointly with the Army Nursing Research Department. Several tools were updated versions of those used in the San Joaquin General Hospital study. Prior to the

on-site visit, the questionnaires were reviewed by nurse experts and field tested by the Army and Navy for content validity. The Workload Management Summary Sheet (see Appendix F), currently being completed by all naval hospitals, was used to obtain specific information about the number and mix of staff assigned by shift to each nursing unit studied. The information from this sheet was translated into a Workload Index modified from a study done by Dale and Mable in 1983.[28]

(3) From the daily Workload Management Summary Sheets mailed monthly by the WMS Coordinator at NH Charleston to the Research Department, Naval School of Health Sciences, a composite computer output report was prepared. This output report summarized monthly staffing figures and reflected which nursing units had problems with overstaffing and understaffing. The data included all submitted reports since October 1983. By examining the figures and graphs, the principal investigator was able to pre-select particular nursing units with staffing variances within the hospital. This served as a basis for determining which nursing units would be selected for reliability testing during the on-site visit. In addition, the computer reports were made available to the Director of Nursing Service.

(4) The Director of Nursing Service at NH Charleston provided the principal investigator with the following: a) the name of the Workload Management System Project Officer; b) verification of all inpatient nursing units broken down by clinical service, type of room, and number of shifts within 24 hours; and c) administrative space and support during the on-site visit. In addition, the researcher offered to present a one hour briefing on the system to all professional nursing personnel and a separate briefing to the Commanding Officer and selected administrative staff.

(5) Reliability testing of the Patient Classification Critical Indicators Instrument (see Appendix G) was conducted by the expert classifier on the following units: ICU, CCU, Pediatrics, Nursery, and pre-selected medical-surgical units based upon historical workload reports. The number of patients classified represented at least 20 percent of the inpatient census. Patients were randomly selected from each category of patients on a nursing unit. A maximum of five patients per category were classified. Reliability testing was conducted for one day on each unit between the hours of 1130 - 1500. The patient profiles, charts, and flowsheets were reviewed for documentation evidence during testing, and scores obtained by the nurse expert were compared to scores assigned by the charge nurse on the daily Patient Classification Worksheet (see Appendix H). An agreement level of 80 percent was set as the minimal acceptable criteria. Agreement was sought between categories, factors, and intra-hospital nursing units (see Appendix I). For Category inter-rater reliability, Kappa Statistic was used with significance set at the $p < .01$ level.[29] Analysis of variance Intra-class correlation coefficient (ICC) was used to demonstrate agreement between factors. The significance level was set at $p < .01$ level.[30]

(6) Pencil and paper demographic questionnaires were distributed to all professional nurses involved with the Workload Management System. In addition, on selected nursing units the charge nurse on each shift for three consecutive days was requested to complete a Unit Staffing Evaluation form and a Nursing Care Evaluation form. Staff nurses on these selected units were also requested to complete the Nursing Care Evaluation form.

(7) Data from the questionnaires were compared to the staffing numbers obtained from the daily Workload Management System Summary Sheets for each unit.

A Statistical Analysis Systems Package (SAS) was used to analyze the information. Statistical tests performed included Kappa Statistic, Intra-class correlations (ICC) and Pearson Product Moment r.

6. FINDINGS.

a. Instruments. At Naval Hospital Charleston, 37 patients on six nursing units representing 45 percent of the inpatient census were classified by the nurse expert using the Patient Classification Critical Indicator Instrument. To gather subjective information from the charge nurses about their perceptions of staffing adequacy, Unit Staffing Evaluation forms were collected for a total of 63 shifts. To evaluate perceptions of care given during these shifts, charge nurses and staff nurses also completed Nursing Care Evaluation Forms. Demographic data to characterize the respondents included information regarding gender, age, rank, and title/position. This staff questionnaire also elicited responses regarding length of time to classify patients; usefulness, strengths, and weaknesses of the WMS; and suggestions for changes in the Critical Indicator Instrument. A total of 64 demographic staff questionnaires were collected. In addition, four supervisory level nurses completed the Project Manager's questionnaire.

b. Description of Subjects. The study group consisted of 64 registered nurses. The group was comprised of 15 males and 49 females with 70 percent being under 34 years of age. Among the nurses, 80 percent were staff nurses, 11 percent were charge nurses and the remaining 9 percent worked in a variety of supervisory roles. All subjects had experience using the Patient Classification Critical Indicator Instrument but only 10 nurses had seen the graphs and daily summary sheets. Over 94 percent of the nurses found the

Workload Management System moderately to very easy to use. The mean time to classify a patient was given as one to three minutes by 73 percent of the nurses.

c. Composite Findings on the Reliability of the Workload Management System. Table 1 provides a comparison of the patient classification category agreement between the nurse expert and charge nurses on six nursing units. The agreement level of 80 percent for inter-rater reliability was met. Pearson product moment correlation coefficient (r) demonstrated a high correlation of .93436. To rule out chance, Kappa Statistic was used. The inter-rater reliability was significant at the $p < .001$ level.

To analyze the inter-rater reliability between factors on the Patient Classification Critical Indicators Instrument, the Intra-class correlation coefficient (ICC) was used. ICC was selected over Pearson product moment correlation coefficient (r) to estimate reliability because Pearson r is not sensitive to different standards between raters, so that raters could vary consistently and still have a high degree of reliability. The ICC data is presented in Table 2. In all cases, the inter-rater reliability between nurse expert and charge nurses for the factors was significant at the $p < .001$ level. The factors with the lowest correlation were teaching and emotional support. This finding supports the historical monthly reliability reports submitted by Naval Hospital Charleston.

Intra-hospital unit reliability using the Patient Classification Critical Indicators Instrument was also evaluated. There was a high level of category agreement (greater than 80 percent) between units. However, because of the small sample size, Kappa Statistic was not used for analysis. After information is collected from the five other study sites, it will be possible to do

Table 1

COMPARISON OF PATIENT CLASSIFICATION CATEGORY AGREEMENT
BETWEEN NURSE EXPERT AND CHARGE NURSES USING
THE CRITICAL INDICATOR INSTRUMENT

Nurse Expert Rating	Charge Nurse Rating: Category 1	Category 2	Category 3	Category 4	Category 5	Row Total
Category 1	5	1	0	0	0	6
Category 2	1	13	1	0	0	15
Category 3	0	1	12	0	0	13
Category 4	0	0	0	2	0	2
Category 5	0	0	0	0	1	1
Column Total	6	15	13	12	1	37

Percent of agreement = 33/37 or 89.2%

Kappa Statistic = .892

Standard Deviation of Kappa = .075

Z score = 11.25

Category agreement was significant at $p < .001$ using Kappa Statistic.

Table 2

INTER-RATER RELIABILITIES FOR FACTORS ON THE CRITICAL INDICATOR INSTRUMENT AS ESTIMATED BY ICC

FACTOR	INTRA-CLASS CORRELATION (ICC)
Vital Signs	.927
Monitoring	.996
Activities of Daily Living	.997
Feeding	.959
Simple Treatments	.919
Complex Treatments	.829
Respiratory Therapy	.876
Intravenous Therapy	.976
Teaching	.793
Emotional	.763
Continuous Care	--

All factors were statistically significant at $p < .001$ using the f test.

intra-hospital reliability testing across clinical services.[31]

d. Composite Findings on the Nurses' Perceptions of Acceptability and Satisfaction With the Workload Management System. Using the information obtained from the Staff Questionnaires (n = 64), perceptions of satisfaction with the WMS were obtained. Specifically, perceptions of accuracy in reflecting level of care required by patients, usefulness as a management tool, and satisfaction with the WMS as a whole were analyzed (See tables 3, 4, 5, 6). An analysis of the correlations between these variables and the roles of nursing staff revealed significant differences in perceptions.

Staff nurses (n = 38) who worked on the clinical units rated the WMS lower than the charge nurses or supervisors in all cases (Table 3). Of this group few (n = 3) had seen the entire WMS in operation which included the staffing summary sheets and monthly graph for their unit (Table 4). Rather, their perceptions appeared to be based solely upon completing the Patient Classification Worksheet.

Charge nurses (n = 7), who have a middle management role in the hospital, perceived the system somewhat more positively. Of these, less than half (n = 3) indicated that they had seen the monthly reports and graphs (Tables 4 and 5). Seventy-one percent of the charge nurses surveyed thought the system was useful as a management tool and accurately reflected the nursing care required (Tables 3 and 6).

Supervisory level nurses (n = 6) rated the WMS at the highest level possible for all variables (Tables 3, 4, 5, and 6). Except for the Quality Assurance Nurse, the supervisory nurses had been involved with all phases of the WMS, that is, patient classification, daily adjustment of staffing on nursing units based upon summary reports, and review of monthly staffing reports and graphs for all units. This total involvement with the WMS may have contributed to the very

Table 3

PERCEPTIONS OF USEFULNESS OF THE WORKLOAD MANAGEMENT SYSTEM AS A MANAGEMENT TOOL BY NURSING ROLE

Nursing Role	Usefulness of WMS as a Management Tool: Very Useful/Useful	Undecided/Not Useful	Row Total
Staff Nurses	24 (48%)	26 (52%)	50 (100%)
Charge Nurses	5 (71%)	2 (29%)	7 (100%)
Supervisor Level Nurses	6 (100%)	0 (0%)	6 (100%)
Column Total	35	28	63

Table 4

SATISFACTION WITH WORKLOAD MANAGEMENT SYSTEM AMONG NURSES WHO HAD SEEN MONTHLY SUMMARY REPORTS AND GRAPHS BY NURSING ROLE

Controlling Variable: Saw Reports and Graphs

Nursing Role	Satisfaction With WMS: Very Satisfied/ Satisfied	Satisfaction With WMS: Neutral/ Dissatisfied	Row Total
Staff Nurses	0 (0%)	3 (100%)	3 (100%)
Charge Nurses	1 (33.3%)	2 (66.6%)	3 (100%)
Supervisor Level Nurses	4 (100%)	0 (0%)	4 (100%)
Column Total	5	5	10

Table 5

SATISFACTION WITH WORKLOAD MANAGEMENT SYSTEM
AMONG NURSES WHO HAD NOT SEEN MONTHLY SUMMARY
REPORTS AND GRAPHS BY NURSING ROLE

Controlling Variable: Did Not See Reports and Graphs

Satisfaction With WMS

Nursing Role	Very Satisfied Satisfied	Neutral/ Dissatisfied	Very Dissatisfied	Row Total
Staff Nurses	11 (31%)	23 (66%)	1 (3%)	35 (100%)
Charge Nurses	1 (50%)	1 (50%)	0 (0%)	2 (100%)
Supervisor Level Nurses	1 (100%)	0 (0%)	0 (0%)	1 (100%)
Column Total	13	24	1	38

Table 6

PERCEPTIONS OF ACCURACY OF WORKLOAD MANAGEMENT SYSTEM
IN REFLECTING LEVEL OF CARE PATIENTS REQUIRE
BY NURSING ROLE

Nursing Role	Perception of Accuracy of WMS: Always/Usually Accurate	Half Time/Sometimes Accurate	Never Accurate	Row Total
Staff Nurses	26 (52%)	19 (38%)	5 (10%)	50 (100%)
Charge Nurses	5 (71%)	2 (29%)	0 (0%)	7 (100%)
Supervisor Level Nurses	6 (100%)	0 (0%)	0 (0%)	6 (100%)
Column Total	37	21	5	63

satisfied responses given by the supervisory level nurses.

The analysis of the nurses' perceptions of the major strengths and limitations of the WMS was not as clear (See tables 7 and 8). Usefulness as a management tool appears to be the greatest strength (n = 35). However, when major strengths were compared to major weaknesses there does not appear to be a direct relationship. No one area appeared to be identified as a major weakness. Rather the strengths and weaknesses were perceived along a continuum between the two extremes.

e. Correlation Between Charge Nurses' Perceptions of the Quality of Nursing Care Given, Staffing Adequacy, and Recommended Staffing Using the Workload Index. From findings obtained during a field test of the WMS in April-May 1983 at two large naval hospitals, it was believed that the quality of nursing care delivered did not change significantly unless a nursing unit was understaffed by at least two persons. To validate this finding the Workload Index was set using the criteria of plus or minus two persons.[32] Table 9 gives a breakdown of the Workload Index for RN, NRN, and total combined staff over 63 shifts. Of special interest is the fact that less than recommended staffing occurred on only eight shifts during the 3 days the study was conducted at Naval Hospital Charleston. The data on one shift could not be included because the charge nurse did not complete a Unit Staffing Evaluation questionnaire. Therefore, using the ±2 staff member criteria only seven shifts (11 percent) had less than the recommended staff while eight shifts (13 percent) had more than the recommended staff. Due to the small size of these samples, the correlation between quality of nursing care, staffing adequacy, and recommended staffing as indicated by the Workload Index were not evaluated in this preliminary study.

Table 7

MAJOR STRENGTHS OF THE WORKLOAD MANAGEMENT SYSTEM

Variable	Agree	
	Frequency	Percent
Ease of Use	18	(28%)
Comprehensive	16	(25%)
Accurately reflects workload	11	(17%)
Takes Little Time To Do	17	(27%)
Reliable	8	(13%)
Usefulness as Management Tool	35	(55%)

Total n = 64

Table 8

MAJOR WEAKNESSES OF THE WORKLOAD MANAGEMENT SYSTEM

Variable	Agree Frequency	Percent
Difficult to Use	1	(2%)
Not Comprehensive	17	(27%)
Inaccurate in Reflecting Workload	27	(42%)
Takes Long Time to do	12	(19%)
Unreliable	13	(20%)
Not Useful as a Management Tool	4	(6%)

Total n = 64

Table 9

WORKLOAD INDEX LEVELS FOR EACH SHIFT BY NURSING PERSONNEL

A. RN Staff

Workload Index	Frequency	Percent
Under Staffed	4	6
Adequately Staffed	56	89
Over Staffed	3	5
	63	100

B. NRN Staff

Workload Index	Frequency	Percent
Under Staffed	3	5
Adequately Staffed	59	94
Over Staffed	1	1
	63	100

C. Total Combined Staff

Workload Index	Frequency	Percent
Under Staffed	7	11
Adequately Staffed	48	76
Over Staffed	8	13
	63	100

Criteria for Workload Index:

Under Staffing:	Minus 2 persons or more
Adequate Staffing:	Between minus 2 persons and plus 2 persons
Over Staffing:	Plus 2 persons or more

f. Composite Findings on Nurses' Perceptions of Direct and Indirect Nursing Care Given Under Various Staffing Levels. Both charge nurses and staff nurses rated the quality of direct and indirect nursing care given on each shift (n = 113). A tabulation of frequencies for each patient classification factor indicated that the nurses perceived direct care was given at a good/optimal level at least 80 percent of the time, except for teaching and emotional support. Even these factors were placed at the good/optimal level at least 55 percent of the time. An analysis of the indirect care activities also revealed a high percentage of good/optimal care ratings. Writing patient care plans and making patient rounds with the physician received the lowest ratings. When comparing charge nurse perceptions (n = 59) to staff nurse perceptions (n = 54) for each variable, the agreement level was found to be greater than 80 percent.

7. DISCUSSION.

The results of this preliminary study indicated that the Workload Management System is valid and reliable. Correlations between nurses' perceptions and the Workload Index were not possible to ascertain due to the small sample of shifts that had less than or more than recommended staff. Several factors need to be considered when collecting data at future test sites.

a. The Workload Index is based upon staffing numbers and mix obtained from the daily Workload Management Summary Sheets which excludes all orientees (personnel who have been at the hospital for less than 4 weeks). Staff nurses and charge nurses were not specifically informed to exclude orientees when rating perceptions of care given on staffing adequacy. A review of the number of orientees on each shift at NH Charleston revealed 15 orientees (11 NRNs on the day shift and 4 NRNs on the night shift). It is possible that the presence of orientees on a nursing unit influenced the perceptions of good/optimal care

given even when understaffed by two persons.

b. Satisfaction or dissatisfaction expressed by nurses about the WMS may be tied to the clinical area in which the nurses work. A review of written comments on the demographic staff evaluation questionnaire indicated that the nurses in the labor and delivery area were very dissatisfied with the WMS. Since questions were not asked about assigned clinical areas, it was impossible to determine if nurses in specialty settings were skewing the findings. Interestingly, when given a choice, the majority (66%) of the nurses opted to continue using the system. They would prefer to classify once a day or more frequently (95%) and do that classification on the day shift (83%).

c. On the daily Workload Management Summary Sheets completed by the Nursing Care Coordinators (supervisors), mistakes were occasionally made in transcribing scores from the Patient Classification Worksheets and in determining the Nursing Care Hours required on a unit. In rare instances, nursing personnel were reassigned by supervisors based upon erroneous calculations of a Work-load Index for a nursing unit.

8. CONCLUSION.

The Workload Management System Patient Classification Critical Indicators Instrument was found to be very reliable for factors, and for categories using Intra-class correlations and Kappa Statistic.

Satisfaction with the WMS among nurses varied according to nursing role. Staff nurses were neutral or dissatisfied in most cases, and this may be related to the fact that they were involved only with patient classification and had not seen the whole system in operation. Whether or not all staff nurses had reviewed or even seen the Workload Management System Educational Workbook is a

pertinent question which will be asked at future test sites. A review of the written comments indicated that dissatisfaction may be related to the specialty area in which a nurse works. This information will be collected at the other five test sites. Charge nurses rated the WMS somewhat higher, and those who had reviewed the summary reports and graphs rated it very high. Supervisory level nurses rated the WMS as satisfactory or very satisfactory.

Because less than recommended staffing occurred on only seven of the 64 shifts during the time of the study, a relationship could not be demonstrated between charge nurses' perceptions of quality of care given or staffing adequacy with the Workload Index. Likewise, perceptions of direct and indirect care activities performed under various staffing configurations could not be determined. It is anticipated that with data obtained from five other CONUS hospitals, the correlation between staffing and perceptions of quality care given can be evaluated.

Appendices A - J

Naval School of Health Science
Research Division

APPENDIX A

WORKLOAD MANAGEMENT SYSTEM FOR NURSING

STAFF QUESTIONNAIRE

1. Gender
   _____ 1. Male
   _____ 2. Female

2. Age
   _____ 1. 20-24
   _____ 2. 25-29
   _____ 3. 30-34
   _____ 4. 35-39
   _____ 5. 40-44
   _____ 6. 45-49
   _____ 7. 50-54
   _____ 8. 55+

3. Rank
   _____ 1. ENS
   _____ 2. LTJG
   _____ 3. LT
   _____ 4. LCDR
   _____ 5. CDR
   _____ 6. CAPT
   _____ 7. GS-7
   _____ 8. GS-8
   _____ 9. GS-9
   _____ 10. GS-10
   _____ 11. GS-11

4. Title/Position
   _____ 1. Staff Nurse
   _____ 2. Charge Nurse
   _____ 3. Area Coordinator
   _____ 4. Quality Assurance Coordinator
   _____ 5. Educational Coordinator
   _____ 6. Director or Assistant Director of Nursing
   _____ 7. Other. Specify: _____

5. During the past six months, how frequently did you use the Workload Management System to classify patients?
   _____ 1. Each shift
   _____ 2. Daily
   _____ 3. Did not use

6. How long does it take you to classify a patient? (on the average)
   _____ Minutes _____ Seconds

7. How would you rate the ease of using the Workload Management System?
   _____ 1. Very Easy
   _____ 2. Easy
   _____ 3. Moderately Easy
   _____ 4. Difficult
   _____ 5. Very Difficult

8. Do you believe the categories of care (I to VI) determined by the Workload Management System accurately reflect the level of care your patients required?
   _____ 1. Always
   _____ 2. Usually
   _____ 3. Half of the time
   _____ 4. Sometimes
   _____ 5. Never

9. How would you rate the usefulness of the Workload Management System as a management tool?
   _____ 1. Very Useful
   _____ 2. Useful
   _____ 3. Undecided
   _____ 4. Not useful
   _____ 5. Hinderance to management

10. How do you feel about the Workload Management System as a whole?
   _____ 1. Very Satisfied
   _____ 2. Satisfied
   _____ 3. Neutral
   _____ 4. Dissatisfied
   _____ 5. Very dissatisfied

11. What do you see as the major strengths of this Workload Management System? (You may select more than one)
   _____ 1. Ease of use
   _____ 2. Comprehensive. (Content is complete)
   _____ 3. Accurately reflec ts the workload
   _____ 4. Requires minimum time to complete
   _____ 5. Relaible. (Same results obtained from one staff member to another)
   _____ 6. Useful as a management tool
   _____ 7. Other. Specify:_____
   _____ 8. There are none

12. What do you see as the major weaknesses of this Workload Management System? (You may select more than one)
   _____ 1. Difficult to use. Complex.
   _____ 2. Not comprehensive. (Content is not complete)
   _____ 3. Inaccurate. (Does not reflect the workload).
   _____ 4. Requires too much time to complete.
   _____ 5. Unreliable. (Different results obtained from one staff member to another
   _____ 6. Not useful as a management tool
   _____ 7. Other. Specify:_____
   _____ 8. There are none.

13. Given a choice would you:
   _____ 1. Continue to use this system.
   _____ 2. Develop another system.
   _____ 3. Use another existing system. Specify:_____
   _____ 4. Use no classification system.

14. How often do you think patients need to be classified in order to accurately capture your workload?
   _____ 1. Every shift.
   _____ 2. Once every 24 hours
   _____ 3. Once per week
   _____ 4. Other. Specify:_____

15. Should you be required to classify your patients once a day, which shift do you believe would best reflect your workload?
_____ 1. Days
_____ 2. Evenings
_____ 3. Nights

16. Are there any significant critical indicators missing that you believe should be included?
_____ 1. No
_____ 2. Yes. Specify:_____

17. Are there any significant critical indicators that you believe should be deleted?
_____ 1. No
_____ 2. Yes. Specify:_____

18. Should the point value of any of the critical indicators be changed?
_____ 1. No
_____ 2. Yes. Specify and explain:

19. Could the Patient Classification Worksheet be better designed to facilitate its use?
_____ 1. No
_____ 2. Yes. Specify:

20. How would you improve the Workload Management System?

21. General Comments:

22. Have you seen the Daily Summary Sheets and the Monthly Summary Graphs comparing the recommended staffing for your ward based on the Workload Management System to your actual staffing levels?

_____ 1. No
_____ 2. Yes

If your answer was Yes to the above question (#22), please complete the following by circling your response:

	HIGH	ADEQUATE	LOW
1. The recommended staff levels for the day shift was	3	2	1
2. The recommended staffing levels of RN's for the day shift was	3	2	1
3. The recommended staffing levels of Para's for the day shift was	3	2	1
4. The recommended staffing levels for the evening shift was	3	2	1
5. The recommended staffing levels of RN's for the evening shift was	3	2	1
6. The recommended staffing levels of Para's for the evening shift was	3	2	1
7. The recommended staffing levels for the night shift was	3	2	1
8. The recommended staffing levels of RN's for the night shift was	3	2	1
9. The recommended staffing levels of Para's for the night shift was	3	2	1

APPENDIX B

Naval School of Health Science
Research Division

WORKLOAD MANAGEMENT SYSTEM FOR NURSING

PROJECT MANAGERS

To be completed by those who were responsible for completing the reliability checks, the Daily Summary Sheets, and the Monthly Graphs.

1. How long did it take you to do the reliability testing, on the average, for nursing unit? _____ minutes.

2. How often do you believe this reliability testing is needed?
   _____ 1. weekly
   _____ 2. every 2 weeks
   _____ 3. every month
   _____ 4. every other month
   _____ 5. every quarter
   _____ 6. Other. Specify:_____

3. At your Medical Treatment Facility, who would be the best one to conduct the reliability tests?
   _____ 1. Staff Nurse
   _____ 2. Charge Nurse
   _____ 3. Area Coordinator
   _____ 4. Quality Assurance Coordinator
   _____ 5. Educational Coordinator
   _____ 6. Assistant Director of Nursing
   _____ 7. Other. Specify_____

4. What is your perception of staff acceptance of the Workload Management System?
   _____ 1. Very Positive
   _____ 2. Positive
   _____ 3. Neutral
   _____ 4. Negative
   _____ 5. Very Negative

5. How would you rate the ease of using the Personnel Requirements Charts to determine the recommended staffing?
   _____ 1. Very Easy
   _____ 2. Easy
   _____ 3. Moderately Easy
   _____ 4. Difficult
   _____ 5. Very Difficult

6. Do you believe the Daily Summary Sheet could be better designed to facilitate its use?
   _____ 1. No
   _____ 2. Yes. Specify:_____

7. Do you believe the Monthly Summary Graph could be better designed to facilitate its use?
   _____ 1. No
   _____ 2. Yes. Specify:_____

APPENDIX C

Naval School of Health Sciences
Research Division

WORKLOAD MANAGEMENT SYSTEM FOR NURSING

UNIT STAFFING EVALUATION FORM

Hospital_____ Shift: ( ) Days 07-15
Date_____ ( ) Evenings 15-23
Unit_____ ( ) Nights 23-07

CHARGE NURSES: Please complete at or towards the end of the shift.

1. Many factors can influence scheduled staffing patterns for a nursing unit on a given shift. Please evaluate the following factors as they apply to the shift just completed. Circle the number that corresponds to your response:

   4 = Greater than usual
   3 = Usual
   2 = Less than usual
   1 = Not applicable

	Greater than usual	Usual	Less than usual	Not applicable
NUMBER OF:				
a. staff scheduled;	4	3	2	1
b. RN's schedules;	4	3	2	1
c. paraprofessionals scheduled;	4	3	2	1
d. staff sick, called in, or pulled to another ward;	4	3	2	1
e. admissions on this shift	4	3	2	1
f. admissions on previous shift	4	3	2	1
g. patients transfered in, transfered out, or discharged;	4	3	2	1
h. post-operative patients (OR today or yesterday);	4	3	2	1
i. patients requiring extensive nursing care times;	4	3	2	1
j. patients requiring special treatments or procedures (IV's, suctioning, dressings, diagnostic tests);	4	3	2	1
k. patients requiring transport or escort by nursing staff;	4	3	2	1

2. Circle the number that corresponds with the response that best describes the shift just completed.

a. In general, the quality of nursing care provided the patients during this shift was:

5 - Optimal
4 - Good
3 - Adequate
2 - Fair
1 - Poor

b. In general, the staffing for this shift was:

5 - Optimal
4 - Good
3 - Adequate
2 - Fair
1 - Poor

c. Staffing changes were needed:

2 - No
1 - Yes

d. Additional staff was needed:

2 - No
1 - Yes

Indicate how many more staff members were needed:
_____ RNs
_____ Paraprofessionals
_____ MRTs/Ward Clerks
_____ Other (specify): _____

e. Less staff was needed:

2 - No
1 - Yes

Indicate how many staff members were not needed:
_____ RNs
_____ Paraprofessionals
_____ MRTs/Ward Clerks
_____ Other (specify): _____

3. Complete the following information:

a. Total number of patients in each category at end of the shift:

_____ Category I
_____ Category II
_____ Category III
_____ Category IV
_____ Category V
_____ Category VI

b. Number of admissions and discharges during this shift:
_____ Number of admissions and transfers in during this shift.
_____ Number of discharges and transfers out during this shift.

c. Number and mix of personnel that worked on your unit this shift:

PERSONNEL	NUMBER	HOURS WORKED
RNs	_____	_____
Orientees	_____	_____
Paraprofessionals	_____	_____
Ward Clerks	_____	_____
Others (specify):		
_____	_____	_____
_____	_____	_____
_____	_____	_____
TOTALS:	_____	_____

DO NOT WRITE IN THIS SPACE. TO BE COMPLETED BY THE RESEARCHER

UNIT	OPEN ROOMS ☐	NURSERY ☐ LIGHT ☐	ACUTE ☐			
CLASS	PATIENTS D E N	CARE HOURS D E N	ICU ☐	RN	PARA	TOTAL
			ACTUAL			
I			RECOMMENDED			
II			DIFFERENCE			
III			CHANGES			
IV			TOTAL			
V						
VI			ORIENTEES			
TOTAL			ADMISSIONS			

APPENDIX D

NAVAL SCHOOL OF HEALTH SCIENCES
RESEARCH DIVISION

WORKLOAD MANAGEMENT SYSTEM FOR NURSING

NURSING CARE EVALUATION FORM

Hospital:_____ Shift: ( )Days 07-15

Date:_____ ( )Evenings 15-23

Unit:_____ ( )Nights 23-07

CHARGE NURSE: Please complete at or towards the end of the shift

1. Evaluate to the best of your knowledge the quality of nursing care provided the patients during this shift. Using the following scale, circle your response.

5-Optimal care
4-Good care
3-Adequate care
2-Fair care
1-Poor care
0-Not applicable

DIRECT CARE:	Optimal care	Good care	Adequate care	Fair care	Poor care	Not applicable
THE PERFORMANCE AND ASSESSMENT OF:						
a. vital signs;	5	4	3	2	1	0
b. monitoring activities (I&O; circulation fundus and neuro checks; cardiac, apnea, temperature & pressure monitoring);	5	4	3	2	1	0
c. activities of daily living (baths, weights, toileting, positioning & routine patient assessment);	5	4	3	2	1	0
d. nutritional activities (tube feedings, bottle feedings, TPN);	5	4	3	2	1	0
e. treatments, procedures, and medication administration (dressings, ambulation of patients, assisting the MD);	5	4	3	2	1	0
f. respiratory treatments (O_2, IPPB incentive spirometer, chest PT, trachea care, suctioning);	5	4	3	2	1	0
g. intravenous therapy (dressing changes, IV medication, blood products);	5	4	3	2	1	0
h. teaching (Pre-op, admission, special);	5	4	3	2	1	0
i. patient and family emotional support (modification of lifestyle, sensory deprivation).						

2. Evaluate to the best of your knowledge the accomplishment of the following aspects of work during this shift. Using the following scale, circle your response.

5 - Optimally done
4 - Well done
3 - Adequately done
2 - Fairly done
1 - Poorly done
0 - Not applicable

INDIRECT CARE:	Optimally done	Well done	Adequately done	Fairly done	Poorly done	Not applicable
a. Documenting nursing care;	5	4	3	2	1	0
b. Processing and implementing new physician's orders;	5	4	3	2	1	0
c. Processing and implementing new nurse's orders;	5	4	3	2	1	0
d. Initiating and updating patient care plans;	5	4	3	2	1	0
e. Performing administrative duties (Committees attended, schedules determined, evaluations written);	5	4	3	2	1	0
f. Making patient rounds;	5	4	3	2	1	0
g. Making patient rounds with the physicians;	5	4	3	2	1	0
h. Insuring scheduled meal times and break periods for ward personnel;	5	4	3	2	1	0
i. Orienting new personnel.	5	4	3	2	1	0

APPENDIX E

NAVAL SCHOOL OF HEALTH SCIENCES
RESEARCH DIVISION

WORKLOAD MANAGEMENT SYSTEM FOR NURSING

NURSING CARE EVALUATION FORM

Hospital:_____

Date:_____

Unit:_____

Shift: ( )Days 07-15
( )Evenings 15-23
( )Nights 23-07

STAFF NURSES: Please complete at or towards the end of the shift

1. Evaluate to the best of your knowledge the quality of nursing care provided the patients during this shift. Using the following scale, circle your response.

5-Optimal care
4-Good care
3-Adequate care
2-Fair care
1-Poor care
0-Not applicable

DIRECT CARE:	Optimal care	Good care	Adequate care	Fair care	Poor care	Not applicable
THE PERFORMANCE AND ASSESSMENT OF:						
a. vital signs;	5	4	3	2	1	0
b. monitoring activities (I&O; circulation fundus and neuro checks; cardiac, apnea, temperature & pressure monitoring);	5	4	3	2	1	0
c. activities of daily living (baths, weights, toileting, positioning & routine patient assessment);	5	4	3	2	1	0
d. nutritional activities (tube feedings, bottle feedings, TPN);	5	4	3	2	1	0
e. treatments, procedures, and medication administration (dressings, ambulation of patients, assisting the MD);	5	4	3	2	1	0
f. respiratory treatments (O_2, IPPB incentive spirometer, chest PT, trachea care, suctioning);	5	4	3	2	1	0
g. intravenous therapy (dressing changes, IV medication, blood products);	5	4	3	2	1	0
h. teaching (Pre-op, admission, special);	5	4	3	2	1	0
i. patient and family emotional support (modification of lifestyle, sensory deprivation).						

2. Evaluate to the best of your knowledge the accomplishment of the following aspects of work during this shift. Using the following scale, circle your response.

5 - Optimally done
4 - Well done
3 - Adequately done
2 - Fairly done
1 - Poorly done
0 - Not applicable

INDIRECT CARE:	Optimally done	Well done	Adequately done	Fairly done	Poorly done	Not applicable
a. Documenting nursing care;	5	4	3	2	1	0
b. Processing and implementing new physician's orders;	5	4	3	2	1	0
c. Processing and implementing new nurse's orders;	5	4	3	2	1	0
d. Initiating and updating patient care plans;	5	4	3	2	1	0
e. Performing administrative duties (Committees attended, schedules determined, evaluations written);	5	4	3	2	1	0
f. Making patient rounds;	5	4	3	2	1	0
g. Making patient rounds with the physicians;	5	4	3	2	1	0
h. Insuring scheduled meal times and break periods for ward personnel;	5	4	3	2	1	0
i. Orienting new personnel.	5	4	3	2	1	0

Hospital Name ______________________

Hospital UIC [| | | |]

WORKLOAD MANAGEMENT SUMMARY SHEET

APPENDIX F

Year [|]   Month [|]

Day	OPEN ☐ LIGHT ☐	ROOMS ☐ NURSERY ☐	ACUTE ☐ ICU ☐	Staffing PM			Night			AM		
	Class	Number of Patients	Nursing Care Hours	RN	NRN	Total	RN	NRN	Total	RN	NRN	Total
[ ]	I		Actual									
	II		Recommended									
	III		Difference									
Ward	IV		Changes									
[| |]	V		Total									
	VI											
	Total		Orientees									

ADMISSIONS ____ ____ ____

Day	OPEN ☐ LIGHT ☐	ROOMS ☐ NURSERY ☐	ACUTE ☐ ICU ☐	Staffing PM			Night			AM		
	Class	Number of Patients	Nursing Care Hours	RN	NRN	Total	RN	NRN	Total	RN	NRN	Total
[ ]	I		Actual									
	II		Recommended									
	III		Difference									
Ward	IV		Changes									
[| |]	V		Total									
	VI											
	Total		Orientees									

ADMISSIONS ____ ____ ____

Day	OPEN ☐ LIGHT ☐	ROOMS ☐ NURSERY ☐	ACUTE ☐ ICU ☐	Staffing PM			Night			AM		
	Class	Number of Patients	Nursing Care Hours	RN	NRN	Total	RN	NRN	Total	RN	NRN	Total
[ ]	I		Actual									
	II		Recommended									
	III		Difference									
Ward	IV		Changes									
[| |]	V		Total									
	VI											
	Total		Orientees									

ADMISSIONS ____ ____ ____

Day	OPEN ☐ LIGHT ☐	ROOMS ☐ NURSERY ☐	ACUTE ☐ ICU ☐	Staffing PM			Night			AM		
	Class	Number of Patients	Nursing Care Hours	RN	NRN	Total	RN	NRN	Total	RN	NRN	Total
[ ]	I		Actual									
	II		Recommended									
	III		Difference									
Ward	IV		Changes									
[| |]	V		Total									
	VI											
	Total		Orientees									

ADMISSIONS ____ ____ ____

Key:

Actual - staff who were scheduled to work each shift (less absentees).
Recommended - required staffing level as determined by nursing care hours.
Difference - subtract recommended from actual.
Changes - modifications to actual.
Total - staff who worked each shift (staff scheduled plus or minus changes).
Orientees - orientees who worked each shift

PATIENT CLASSIFICATION CRITICAL INDICATORS

VITAL SIGNS (MANUAL TPR, BP)

(2) Vital signs qid or less
(3) Vital signs q4h or x 6
(6) Vital signs q2h or x 12
(12) Vital signs q1h or x 24
(2) Rectal or axillary temps q4h or more
(2) Apical or femoral or pedal pulses or FHT q4h or more
(2) TIR tests q4h or more
(6) Routine post-op

MONITORING

(2) Intake and output q8h
(6) Intake and output q2h
(2) Circulation or fundus checks q2h or x 12
(3) Neuro checks q4h or x 6
(6) Neuro checks q2h or x 12
(2) CVP or ICP (manual) q2h or x 12
(6) Cardiac/apnea/temp/pressure monitors (not additive)
(6) Transcutaneous monitor
(4) A-line or ICP (monitor) or Swan Ganz set-up
(2) A-line or ICP (monitor) reading q2h or x 12
(2) PAP/PA wedge reading q4h or x 6
(4) PAP/PA wedge reading q2h or x 12
(5) Cardiac output q4h or x 6

ACTIVITIES OF DAILY LIVING

(6) Infant/toddler care (≤5years)
(2) Self care (adult or child ≥ 5 years)
(6) Assisted care (≥5 years) - positions self
(18) Complete care (≥5 years) - assist with positioning
(34) Total care (≥ 5 years) - position and skin care q2h
(4) Extra linen change and partial bath 2x per shift
(14) Turning frame (2 staff to turn q2h)
(8) Peds recreation/observation ≤ 5 years (exclude NBN)

FEEDING

(5) Tube feed adult/child/neonate q4h or x 6
(10) Tube feed adult/child/neonate q2h or x 12
(6) Adult meals > 5 years (spoon feed x 3)
(10) Child meals < 5 years (spoon feed x 3)
(2) Infant/neonate bottle x 1 feeding
(12) Infant/neonate bottle q4h or x 6
(24) Infant/neonate bottle q2h or x 12

TREATMENTS/PROCEDURES/MEDICATIONS

Simple > 15 and < 30 Minutes Total

(2) Start IV or NG insertion or Foley insertion or EKG
(2) Surgical prep or enemas or ace wraps/elastic stockings
(2) Simple dressing or tube care, Foley care (exclude trach)
(2) S&A or SpGr or Guiac or spin HCT x 6
(2) Lab studies x 6; ABG or blood culture x 3
(2) Medications q3h - q8h (exclude IV)
(2) Irrigations or instillations x 4 or less
(2) Restraints (2 or 4 point or posey)
(2) Assist to chair or stretcher and return x 3
(2) Assist to walk and return x 1
(2) Infant circumcision or phototherapy
(2) Accompany patient off ward >15 minutes and < 30 minutes
(2) Other activities requiring > 15 minutes and < 30 minutes

Complex > 30 minutes and < 1 Hour Total

(4) Chest tube insertion or lumbar puncture
(4) Thoracentesis or paracentesis
(4) Complex dressing change (>30 minutes to complete)
(4) Straight catheterization x 4 or more
(4) Medication q2h or more (exclude IV)
(4) Range of motion exercises x 3
(4) Accompany patient off ward > 30 minutes
(4) Other activities requiring > 30 minutes and < 1 hour

Special Procedures > 1 Hour Total

(8) Each complete hour requiring continuous staff attendance or assistance

RESPIRATORY THERAPY

(2) Oxygen therapy or oxyhood
(2) Incentive spirometer or C&DB q4h
(2) IPPB or mainist bid or x 2
(4) IPPB or mainist q8h or x 4
(6) IPPB or mainist q4h or x 6
(8) Croup tent or mist tent
(2) Chest pulmonary therapy bid or x 2
(4) Chest pulmonary therapy q8h or x 4
(6) Chest pulmonary therapy q4h or x 6
(2) Suctioning q4h or x 6
(4) Suctioning q2h or x 12
(10) Ventilator
(4) Tracheostomy care x 3

IV THERAPY

(4) KVO
(4) Heparin lock or Brovac
(6) Simple (change bottle q6-8 hours)
(8) Complex (two or more sites or change bottle q4h)
(2) Medication q8h or x 3
(3) Medication q6h or x 4
(4) Medication q4h or x 6
(4) Blood products

TEACHING AND EMOTIONAL SUPPORT

(What to be documented)

Teaching

(4) Admission assessment and orientation
(4) Preoperative teaching
(4) Special structured teaching (i.e. diabetic, cardiac, colostomy care, postpartum first 24 hrs, newborn care, etc.)

Emotional Support (in excess of 30 minutes q 24 hours.)

(4) Patient/family support (i.e. anxiety, denial, loneliness, etc
(4) Modification of lifestyle (i.e. new prosthesis, body image, behavior modification, etc.)
(8) Sensory deprivation (i.e. retarded, deaf, blind, language b[illegible], bilateral eye patches, confused, combative, etc.)
(10) Maximum points for emotional support

CONTINUOUS

(96) Patient requiring 1:1 coverage all shifts (i.e. peritoneal dialysis, combative, etc.)
(148) Patient requiring greater than 1:1 coverage all shifts (i.e. ventilator with multiple vasopressors, IABP, etc.)

APPENDIX H

WORKLOAD MANAGEMENT

PATIENT CLASSIFICATION WORKSHEET

UNIT_____

DATE_____

TIME_____

SIGNATURE_____

	PATIENT NAMES																							
VITAL SIGNS																								
MONITORING																								
ACTIVITIES																								
FEEDING																								
SIMPLE																								
COMPLEX																								
SPECIAL																								
RESP THERAPY																								
IV THERAPY																								
TEACH/EMOT																								
CONTINUOUS																								
TOTAL POINTS																								

I	0-12	I
II	13-31	II
III	32-63	III
IV	64-95	IV
V	96-145	V
VI	+ 146	VI
		TOTAL

NOTES:

1. Double points for any treatment/procedure that requires 2 nursing staff members.
2. Adjust points to accomodate frequency, i.e. IPPB q2h - 12 points.
3. Admissions and day of surgery are automatically at least a Category II.
4. Count only those procedures performed by the nursing staff.

APPENDIX I

PATIENT CLASSIFICATION RELIABILITY TESTING INSTRUMENT

Ward/Unit _____ Date _____

Census _____ Signed _____

SAMPLE SELECTION ($\frac{\#\text{ checked}}{\text{census}}$) % agreement

Category 1	Category 2	Category 3	Category 4	Category 5	Category 6	Total

AGREEMENT BY CATEGORY ($\frac{\#\text{ agreed}}{\#\text{ checked}}$) % agreement

Category 1	Category 2	Category 3	Category 4	Category 5	Category 6	Total

AGREEMENT BY FACTORS ($\frac{\#\text{ agreed}}{\#\text{ checked}}$) % agreement

Category 1	Category 2	Category 3	Category 4	Category 5	Category 6	Total

NOTES EXPLAINING DIFFERENCES IN FACTORS MARKED:

WORKLOAD MANAGEMENT SYSTEM EVALUATION STUDY

• FOR OFFICIAL USE ONLY •

DISCLOSURE STATEMENT

The purpose of this study is to evaluate the validity and reliability of the Workload Management System (WMS) for Nursing. In agreeing to participate in this study, you are being asked to complete a questionnaire concerning:

(1) Demographic information and an overview of your assessment of the WMS.

(2) An assessment of the staffing assigned to your unit.

(3) An assessment of the nursing care given to patients on your shift.

(4) For WMS project managers, an assessment of the forms used to collect workload to determine staffing.

You should understand that ALL questionnaire answers and other data you provide WILL BE TREATED AS STRICTLY CONFIDENTIAL, and will be used for RESEARCH PURPOSES ONLY. All questionnaires will be returned directly to the Research Division, Naval School of Health Sciences, Bethesda, MD, where they will be kept. The results of this study will be tabulated and reported in summary form only, and it will NOT be possible to identify any single individual in the report.

You should also understand that (a) your participation in this study is encouraged, but voluntary, (b) that the results of this study will be published in a technical report which will be made available to your hospital, and (c) there are no immediate benefits to you personally for participating in this study, although your feedback now may be instrumental in making constructive modifications to the system.

Finally, you should also understand that if you have any questions regarding this study at any time in the future, you may contact the following individual who will assist you.

CDR KAREN A. RIEDER, NC, USN
Research Department
Naval School of Health Sciences
Bethesda, Maryland 20814

Phone: (202) 295-1467

THANK YOU FOR YOUR COOPERATION

FOOTNOTES

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19. R.G. Vaugham and V. MacLeod, "Nurse Staffing Studies: No Need to Reinvent the Wheel," The Journal of Nursing Administration 10 (March 1980): 10.

20. Ibid, p. 8.

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

nursing, patient classification, hospital, personnel, staffing, nursing care requirements, workload index

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This is a preliminary report to on a three year study designed to develop, implement, and evaluate the validity and reliability of the Workload Management System (WMS) for Nursing. The system is currently being utilized as the basis for nurse staffing decisions within the Navy Medical Department. This preliminary technical report presents the background information for the study, including hypotheses, literature review and instrumentation, and the results obtained from the first of six test sites.

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20. (Cont.)

To evaluate reliability, 37 patients on six nursing units in the first test hospital were classified by the nurse expert using the patient classification Critical Indicator tool. To gather subjective information from charge nurses about their perceptions of staffing adequacy, Unit Staffing Evaluation tools were completed for a total of 63 shifts. Perceptions of care given during these shifts were obtained from charge nurses and staff nurses using the Nursing Care Evaluation form. Demographic data to characterize the respondents and to evaluate user acceptance were collected using a staff questionnaire (n = 64).

Inter-rater reliability was examined using Kappa Statistic and Intra-class correlations. The relationship between recommended staff numbers and nurses perceptions of staffing adequacy was measured using correlational statistics. Descriptive statistics were ~~utilized~~ used to determine user acceptability of the system.

CONCLUSIONS:

Inter-rater reliability between staff nurses and the nurse investigator exceeded the 80% agreement level with a Pearson correlation of .93. Category agreement was significant at $p > .001$ using Kappa Statistic. Inter-rater reliability for factors within the patient classification critical indicator instrument ranged from .763 to .997 using Intra-class correlation. All factors were significant at $p > .001$ using the f test.

Using information from the staff questionnaires, the system was rated as moderately or very easy to use by 94% of the nurses with a mean time to classify patients given as one to three minutes by 73% of the staff. The system was seen as being usually or always accurate by 59%, useful or very useful by 56%, and 73% were satisfied or neutral toward the system. The major strength of the system was its usefulness as a management tool; the major weakness identified was its inaccuracy in reflecting workload in some specialty areas. Because only eight of the 64 shifts had less than recommended staffing (-2 staff), the correlation between nurses perceptions of quality care given, staffing adequacy, and recommended staffing could not be ascertained.

RECOMMENDATION:

Results of this study be combined with the findings from the other five test hospitals. Final modifications of the system be made based on these findings.

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