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Birch & Davis (1990) conducted a study of nursing care hours required for 80 percent of cases treated in US Army MTFs. They noted a strong correlation, with the exception of four DRGs, between total nursing care hours and acuity.

This study analyzed the nursing care hours (NCHs) required for DRGs 138 and 139 at Wilford Hall USAF Medical Center and compared the results with those found in the Birch and Davis study. Analysis at the diagnosis and the DRG level did not reveal significant variations in NCHs. Total NCHs were found to be strongly related to patient acuity for both DRGs but not strongly related to LOS in either.

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RELATING NURSING CARE REQUIREMENTS
TO
DIAGNOSIS RELATED GROUPS (DRGs)

A Graduate Management Project

Submitted to the Faculty of

Baylor University

in Partial Fulfillment of the

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of

Master of Health Administration

by

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Abstract

The implementation of the prospective payment system (PPS) to reimburse medical treatment facilities (MTFs) for care provided had a definite impact on healthcare facilities. According to the PPS, payments to healthcare facilities include coverage for all aspects of the provision of health care, including the care provided by nurses. With the costs of nursing labor continually rising, healthcare executives must become familiar with the costs of providing nursing care to patients.

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RELATING NURSING CARE REQUIREMENTS
TO
DIAGNOSIS RELATED GROUPS (DRGs)

Introduction

Background

The development of the diagnosis related groups
(DRGs) system of categorizing patients on the
basis of resource consumption and the
implementation of the prospective payment
system (PPS) has introduced a level of
competitiveness into the healthcare
environment never before seen. Hospital
payments under the PPS are based on the
average resource use of patients in each DRG.
Adjustments are made for indirect teaching
expenses, hospital location, and the share of
low-income patients treated. Despite these
adjustments, many healthcare executives are
concerned about the ability of the system
(DRG) to account for the differences in the
cost of care (McNeil, Kominski, & Williams-
Ashman, 1988).

Since implementation of the PPS, dramatic changes
have been seen in admissions, lengths of stay (LOS),
acuity of the patients, and locales of treatment. In
1987, four years after implementation of PPS and

utilization of DRGs, admissions declined by 11 percent and patient acuity increased (McGovern & Newbern, 1988; Hickey, 1987).

During the past two decades, professional nursing executives made progress in identifying relationships between inputs (nursing hours) and outputs (DRGs or patient discharges). Various methods have been developed to determine the amount and intensity of nursing care required for each patient, to associate costs with the identified nursing care needs, and to identify proportions of room charges which can be attributed to the direct and indirect costs of nursing care (McCloskey, 1989; Meeting, Saunders, & Curcio, 1988; O'Connor, 1988; Staley & Luciano, 1984).

Since the use of DRGs by the Medicare PPS is based on the assumption that resource consumption is fairly uniform within specific DRGs, it seems reasonable to assume that use of nursing personnel to provide the care is also similar within specific DRGs. Unfortunately, the latter assumption is incorrect as several research studies reveal that many DRGs contain patients with varying (heterogenous) patterns of nursing resource consumption (Bost & Lawler, 1989; Reschak, Biordi, Holm, & Santucci, 1987).

The existence of heterogeneity within DRGs makes the utilization of a DRG case mix-history difficult to use as a predictor of future resource requirements. The two primary sources of heterogeneity within DRGs appear to be variances in resource consumption and severity of illness. The two factors cannot be separated when considering the provision of nursing care. DRGs exhibit substantial variations in resource use as a result of varying severity of illness and the requirement to provide higher levels of nursing care (Green, McClure, Wintfeld, Birdsall, & Rieder, 1987). Because of the probability of a variance in the use of nursing care for individual cases, it is necessary to identify and refine heterogenous DRGs. This can be done through close examination of nursing care time expended for specific groups of patients, at the DRG and diagnosis level.

In 1990, Congress requested that the Department of Defense (DoD) conduct a study to assess the feasibility of using DRGs to predict nursing resources for military medical treatment facilities (MTFs). The study assessed relationships between the Workload Management System for Nursing (WMSN) patient acuity system and DRGs. Findings demonstrated that nursing care hours varied considerably among different

DRGs, but were fairly well clustered within DRGs. A few DRGs demonstrated variances in nursing care requirements which could complicate the use of a DRG case mix as a predictor of staffing requirements (Birch & Davis, 1990).

Statement of the Problem

Proven methods which accurately and consistently associate nursing care requirements with specific classes of patients do not exist.

Literature Review

In 1983, Public Law 98-21, the Social Security Amendments of 1983, established a prospective payment system (PPS) based on the DRG categories. This payment system established prices for specific groups of hospitalization cases based upon categories of illness (DRGs) and enabled the federal government to implement a method of paying hospitals in an organized, equitable manner for care expected to be rendered to Medicare beneficiaries in the future (Griffith, 1987). The DRG system is based on a medical model which uses medical diagnosis classification of patients as the case-mix measure. Although the costs of nursing care are included in the computations, the pricing system does

not incorporate methods of determining how much nursing care is required for each type of patient nor does it separate nursing resource consumption from other resource consumption (Cromwell & Price, 1988; Shaffer, 1988).

The changing economic incentives in the healthcare industry led to budget decentralization and the increasing tendency to place responsibility for allocated fund utilization at the department level. The shift in responsibility resulted in a greater number of nursing departments required to identify the costs of providing nursing care as a component of the patient's overall bill (Rosenbaum, Willert, Kelly, Grey, & McDonald, 1988). In order to determine the actual costs of providing nursing care, managers must use proven methods to determine the quantity of nursing care required for each patient's hospitalization and then appropriately associate that information with specific patients or groups of patients.

Awareness and utilization of management and cost accounting practices noticeably increased with the advent of the DRG payment system. The Health Care Financial Management Association (HCFA) reported that only 20 percent of the hospitals surveyed could determine their costs by DRG. The report also revealed

that few of the facilities could associate costs with specific procedures (Eastaugh, 1987). There are many reasons why facilities would want to extend the costing of nursing services into DRGs. Determining how much nursing care is required for specific DRGs would help nursing managers (a) determine what portion of the DRG cost is attributable to the nursing care provided for each patient, (b) compare the facility norms with other similar facilities, and (c) set standards for nursing care and staffing patterns. Hospital and nursing managers could also use the results to develop labor usage guidelines (standards) and identify trends for the facility's largest, most expensive cost center (nursing) (Thompson & Dier, 1988).

The most apparent reason for separating nursing labor costs from the traditional hospital room and board charges was the implementation of the DRG prospective payment system (Barhyte & Glandon, 1988). Some facility administrators and nursing service managers contend that the cost of providing nursing care is already known. This may be somewhat true if you simply divide the nursing department total costs by the number of patient days of care provided to obtain a per diem figure of costs per day per patient. However, this process bears little relation to the types or

amounts of nursing care which the patient actually needed or received.

There are several steps which must be completed before the cost of nursing care can be directly attributed to a single patient or group of patients. All studies stressed the need to (a) accurately and consistently identify the total nursing care time required to provide the level of care which the patient needs, and (b) associate that total nursing care time to specific patients or groups of patients (Kyle & Kinder, 1990; Barhyte & Glandon, 1988 Eastaugh, 1987; Staley & Luciano 1984). Methods of computation vary among institutions. The key to accurate identification is consistent use of the methods used to ensure a certain degree of accuracy.

The first step in associating nursing care requirements with DRGs is the development and implementation of a reliable staff allocation method which will provide for comparability of nursing labor requirements throughout the facility and across hospitals (Staley & Luciano, 1984). Nurse staffing allocation systems are frequently associated with patient classification systems (PCS). PCSs are scientifically developed methods which classify and

quantify the amount and level of nursing care required
by patients during their hospitalizations.

Methods of determining the amount and intensity of
nursing care provided to patients were developed and
implemented as early as the 1960s (Reschak, Biordi,
Holm, & Santucci, 1987). The two most frequently used
methods are relative intensity measures (RIMs) and
patient classification systems. The RIMs method
quantifies the time spent in providing patient care by
DRG and assigns relative values to the time spent in
determining costs. The relative values assigned to the
time reflect a relative intensity-of-illness trajectory
for each patient, which correlated with nursing care
delivered (Caterinicchio, 1983). The PCS method
utilizes critical indicators to classify patients into
categories which represent nursing workloads
(requirements). Some PCSs are used to relate the
workload to staffing. Critical indicators are based on
the patient's documented nursing and medical orders
(Giovannetti, 1979).

Well described in the literature, most PCSs were
shown to be valid and reliable within the settings in
which they are employed (Meyer, 1978; Nauert, Leach, &
Watson, 1988). Using a PCS as the standard for
allocating nursing labor enables nurse executives to

determine the relative amount of nursing time each patient requires on a daily basis. Once the patients are classified, the total nursing care time required is tallied for each unit. These totals are then used to plan staffing for the next 24 hour period. The historical data may be used to analyze trends and to plan for future peaks and lulls in patient care requirements, both at the unit and facility level.

Once a proven and reliable resource allocation system, or PCS, has been in use in the facility long enough to develop and document reliability of the instrument, scientific study of the relationships between nursing care requirements and DRGs can begin. The second step in determining the cost of providing nursing care is to associate levels of nursing care with specific groups of patients.

The Workload management System for Nursing (WMSN) combines PCS and nurse staffing methodology in one useful management tool. It is the primary system used to quantify nursing workload in the DoD MTFs. The WMSN resulted from the combined research efforts of the U.S. Army and U.S. Navy to objectively quantify nursing workload, based on patient care needs (critical indicators), and determine the appropriate levels of nursing staff required to provide quality nursing care

(Lieutenant Colonel D. Norton, USA, personal
communication, November 10, 1990).

Reliability and validity for the WMSN was
initially demonstrated in Army and Navy MTFs in 1984.
Further refinements were completed and a revised
version of the system was implemented in Army and Navy
facilities in 1985. In 1983, the Office of the
Assistant Secretary of Defense (Health Affairs) adopted
the WMSN as the basis for the Joint Service Inpatient
Nursing Standards. Representatives of all services
coordinated developments in automation, research,
management, and education for the WMSN. The Air Force
began using the WMSN in 1989 (Birch & Davis, 1990).

Several studies have been conducted to identify
potential relationships between scientifically applied
nursing resource allocation systems and DRGs (Kyle &
Kinder, 1990; Bost & Lawler, 1989; O'Connor, 1988;
Reschak, Biordi, Holm, & Santucci, 1987; Hancock &
Fuhs, 1984; Staley & Luciano, 1984). Kyle and Kinder
(1990) used a PCS to project nursing resource
requirements (staffing) to meet standards of care for
patients assigned to a specific DRG. The results
demonstrated that nursing is only part of the DRG costs
and that it is the most unpredictable. This study also
showed that it was possible to measure the cost of

direct nursing care consumed by patients in a specific
DRG.

Bost and Lawler (1989) used a Nursing Intensity
Index (NII) as the basis for determining the amount and
intensity of nursing care required in a North Carolina
hospital. The NII is thought to be a better PCS
because it uses (a) the patient as the unit of analysis
(rather than the nursing interventions), (b) the
nursing process as its fundamental framework, and (c)
conceptual nursing frameworks. This study demonstrated
statistically significant relationships between NII,
LOS, and charges. It also revealed that some DRGs did
not reflect homogeneity with respect to nursing
intensity levels. This last finding is consistent with
assertions that the PPS does not account for patient
acuity ranges within individual DRGs.

In an effort determine the feasibility of using
DRGs to predict nursing resource requirements for the
military during peacetime, Congress directed the
Department of Defense to conduct a study of the WMSN
patient classification system in use in military MTFs.
The study (Birch & Davis, 1990) assessed existing
relationships between the WMSN and DRGs with the WMSN
data as the dependent variable. The population
consisted of 4,291 patients distributed into 114 DRGs

at 24 U.S. Army hospitals. Ninety-five percent of the cases were from eight of the facilities represented. The findings revealed that nursing care hours varied considerably among the DRGs, but were relatively clustered within each one. Two exceptions were noted: a small group of DRGs (134, 138, and 435) appeared to have mutually exclusive groups of patients (i.e., a bimodal distribution) and DRG 139 was the only one which did not show a strong relation of nursing care hours NCHs) to patient acuity (correlation coefficient of .26). Birch & Davis concluded that the model tested did produce realistic estimates of nursing care hours required for cases within DRGs without outliers. They also stated that DRGs with outliers should be individually assessed for determination of the most precise method of interpretation (Birch & Davis, 1990).

Purpose Statement

The purpose of the study is to identify the nursing care requirements for DRGs 138 and 139 at Wilford Hall USAF Medical Center and analyze the relationship(s) of those requirements to length of stay and acuity levels. The results of the analysis will be compared to the results of the Birch and Davis study

which examined similar relationships identified within the U.S. Army medical treatment facilities.

Methods and Procedures

Definitions

Comorbidity. A pre-existing condition that will, because of its presence with a specific diagnosis, cause an increase in length of stay by at least one day in approximately 75 percent of the cases. (Lorenz & Jones, 1989)

Complication. A condition that arises during the hospital stay that prolongs the length of stay at least one day in approximately 75 percent of the cases. (Lorenz & Jones, 1989)

Diagnosis-Related Group (DRG). A system of classifying diseases and disorders of the body into major diagnostic categories, (e.g., diseases and disorders of the respiratory system). Each category contains a surgical and a medical division. The primary determinant of the DRG is the principal diagnosis, but proper assignment of the DRG also includes consideration of all diagnoses, procedures, conditions, complications, co-morbidities, and signs and symptoms which existed during the hospitalization. (Lorenz & Jones, 1989)

DRG 138. Cardiac arrhythmias and conduction
disorders. Age over 69 years and/or the presence of
complications or comorbidities (Lorenz & Jones, 1989).

DRG 139. Cardiac arrhythmias and conduction
disorders. Age under 70 years and no complications or
comorbidities (Lorenz & Jones, 1989).

Length of Stay (LOS). The length of the
hospitalization, from the day of admission to the day
of discharge. Some facilities count the day of
admission but do not count the day of discharge unless
the patient departs after a specified time of the day.
Other facilities do not count the day of admission but
count the day of discharge.

Patient Classification System (PCS). Patient
classification is generally defined as the grouping of
patients according to some observable or inferred
characteristics (e.g., blood type, medical specialty,
and diagnosis). In nursing, a patient classification
system is a method which identifies and groups patients
into care groups or categories, and quantifies the
categories as a measure of the nursing effort required.
The basis of the PCS is that variations in nursing time
are directly related to patient care needs
(Giovannetti, 1979).

Total Nursing Care Hours. Total NCHs reflects the total hours of nursing care (direct and indirect) for the entire patient stay and is determined by adding the daily nursing care hours for each day of the patient's stay (Jiont Manpower Office, 1989).

Study Setting

Located in Southwest San Antonio, Texas, Wilford Hall USAF Medical Center (WHMC) is the largest hospital in the U.S. Air Force. WHMC is a tertiary care, referral center for 125 Air Force and other MTFs within the military healthcare system. Locally, it serves a population of 172,000, a portion of which may also seek care from Brooke Army Medical Center which is located in Northeast San Antonio. These two facilities also serve a portion of the local civilian population for provision of emergency care.

WHMC is staffed for approximately 794 beds. The daily census averages between 500 and 550 patients. The facility has 32 nursing units, 10 of which provide intensive care for acutely ill or injured patients.

In fiscal year (FY) 1989, WHMC discharged 137 patients whose cases were classified as DRG 138 and 144 patients whose cases were classified as DRG 139. According to Retrospective Case Mix Analysis System

(RCMAS) data for WHMC discharges during FY 1989, these two DRGs ranked as number 41 and number 37, respectively. For FY 1989, total discharges for the facility were reported as 26,025. These two DRGs accounted for only one percent of the facility discharges.

Instrument

The WMSN has been in use in WHMC for approximately one and one-half years. Implementation of the PCS was carried out in an organized and methodical manner. Appropriate operating instructions were developed prior to implementation and distributed to all necessary areas of the facility (Major C. Bowe, USAF, personal communication, April 10, 1990).

General guidelines and usage instructions for the WMSN are contained in the Nursing Service Operating Instruction (NSOI) 168-1: Workload Management System for Nurses (Division of Nursing, 1990). Computation of the acuity level is accomplished daily, between 1200 and 1400 hours, using specially prepared worksheets. The final calculation is then transferred to the nursing service information system for use at management level. The acuity level is also to be recorded in the medical record on the vital signs

record. The NSOI states that the worksheets are not a
part of the completed medical record after discharge
but does not specify what is to be done with them
(worksheets) once they are completed. Discussions with
unit managers reveal that they are routinely kept on
the unit from which the patient is discharged.

Population

The population studied includes all patients
discharged from WHMC from 1 January 1991 through 31
August 1991. The list of patients who would be
included was developed from the Automated Quality of
Care Evaluation Support System (AQCESS) based upon the
primary diagnoses entered into the system after the
full medical record review was completed and coded by
appropriately qualified medical records personnel.
Primary diagnoses (Appendix A) included in the study
are specified in The International Classification of
Diseases, 9th revision, Clinical Modification (ICD-9-
CM) (Jones, Uttenreither, Meisch, & Arron (Eds), 1980).

Study Design

This study is designed primarily as a replication
of the Birch and Davis study in an effort to determine
if WHMC patients who fall into DRGs 138 and 139 exhibit

similar relational characteristics. These two DRGs
were selected because they both utilize the same
primary discharge diagnoses, differentiation being in
age and the existence of complications and/or
comorbidities. Data gathered in this study is the same
as that in the Birch and Davis study with analysis
completed at the diagnosis level as well as the
aggregate DRG level.

The first phase of the study was determining the
cases to be included in the study. Preliminary data
collection from AQCESS revealed that 73 patients with
the specified primary diagnoses were discharged between
1 January 1991 and 31 March 1991. Using extrapolation
techniques, the potential population for the five
month, 100 percent review study is approximately 120
patients. Each case was processed through a DRG
grouper and eliminated if not classified as either DRG
138 or 139. Data was gathered for each case and cases
with the same primary diagnosis were grouped together.

The second phase of the study was the statistical
evaluation of the data collected. Cases were
aggregated by primary diagnosis for initial analysis
and then grouped according to DRG for final analysis.
Using the primary diagnosis as the aggregate may reveal
some differentiating characteristics which could

support the theory that some DRGs do not represent homogenous groupings and that further refinement of the DRGs is necessary.

Data Collection

Nursing care requirements were associated with DRG 138 and 139 through collection of diagnosis specific data and patient specific data.

Diagnosis specific data. A special report from AQCESS provided a list of cases with the following data about each: (a) the primary discharge diagnosis (by ICD-9-CM code), (b) the register number, (c) the patient's name, (d) the patient's age, (e) the admission date, (f) the discharge date, (g) the unit from which the patient was discharged and (h) the length of stay.

Patient specific data. Patient specific data to be retrieved included (a) the register number, (b) the name, (c) the primary diagnosis, and (d) the assigned acuity level for each day of the hospital stay as computed according to the WMSN guidelines (Appendix B).

Verification of the location of the calculated acuity level revealed that nursing personnel do not record the acuity level in the medical record in the

prescribed manner (NSOI 168-1). Since the nursing
service information system and AQCESS are not
compatible programs, it was necessary to use a
combination of computer products and worksheets to
determine the acuity levels. Because the computed
acuity level was not documented in the medical record,
the patient's name and register number were used to
ensure proper association of the patient to the
computer products or worksheets from which acuity data
was retrieved. Appropriate precautions were taken to
ensure the privacy of each patient. Data was organized
according to register number to provide an appropriate
audit trail; all other identification data was
destroyed after the study was completed.

Problems encountered. During the collection of
the acuity data several problems with utilization of
the WMSN at WHMC were noted. Completed worksheets were
inconsistently maintained on the nursing units, a
problem fully expected due to the lack of guidelines
for retention of the documents. Until a computer
product was received on a daily basis, it was necessary
to collect, organize, file, and sift through the
worksheets for the three units most frequently
represented in the study. One of the units routinely
recorded the computed acuity level in an assignment

book but discarded the worksheets every couple of weeks. Because of the inconsistent and disorganized manner in which the worksheets were handled after completion, few of the cases identified during the January - May 1991 period are included in the study.

Computer products became available during June 1991. Coordination for use of the computer products included a request for printing of archived daily files. Unfortunately, the facility only maintains 30 days of archived files for the nursing information system. This meant that the earliest products available were from late May 1991.

June, 1991 was the first month of the study where all cases identified could be used because of availability of acuity data. The acuity data was collected from a combination of all three currently identified sources: the unit assignment book, the worksheets, and the computer products. While compiling the June data several things were noted: (a) some worksheets were blank but there was data in the computer system; (b) the computed acuity classification on the worksheet was not the same as the classification in the computer, sometimes it was higher and sometimes it was lower; (c) hospitalization dates in the computer system usually did not match the dates on the

worksheet; (d) some patients were not in the computer system until two to four days after the admission date; and (e) one or two day hospitalizations were rarely on the computer reports.

Accuracy of data was identified as a potential source of problems because of the discrepancy in data between computation and the information system. Based on the process that the worksheet computation of acuity classification must be completed prior to entering data into the computer, the following hierarchical process was used to collect the acuity data: first source, the worksheet; second source, the computer; and third source, the assignment book. Though the assignment book is kept by shift, data is frequently missing due to inconsistency of maintenance of the record and illegibility.

One final problem was encountered when analyzing the results. One case classified as DRG 139 was questioned for validity because of the high mean NCHs, high total NCHs and high acuity. If the case were retained within the DRG, it represented an outlier. Researching the case with the Inpatient Records Director revealed that coding and data entry into AQCESS had been based solely on the admission diagnosis: the record had never been received from the

nursing unit. The record folder contained only the
original admission authorization form and a copy of a
surgical procedure report. When discussing the process
for coding cases with incomplete records, the usual
procedure did not included securing copies of other
reports (e.g., history and physical, discharge summary,
etc) completed by the transcription department. If
there were other records with similar situations, other
cases could be adversely affected. Only a 100 percent
review of all cases used in the study would eliminate
this problem.

Results

Descriptive Statistics

Between 1 January, 1991 and 31 July, 1991, 274 cases were examined for inclusion in the study. Of the 148 cases classified as either DRG 138 or DRG 139, only 86 cases were actually used because of unavailability of acuity data during the early phase of the study. Table 1 shows the breakdown of the cases examined. Final analysis is based on 21 cases for DRG 138 and 65 cases for DRG 139.

Table 2 depicts the breakdown of cases within each DRG and provides a comparison of the diagnosis codes, LOS, nursing care hours (mean hours per day and mean total hours), and acuity. Of the 38 possible diagnoses which fall into these two DRGs, only 12 were identified as primary diagnoses for the cases included in the study. Six (6), 50 percent, of the diagnoses were common to both DRGs. Diagnosis code 42731, Atrial Fibrillation, accounted for 50 percent (43) of the cases, with DRG 139 encompassing 33 of the 43. Diagnosis code 42789, Other Cardiac Dysrhythmias, was the second largest group, accounting for 10 cases: 2 for DRG 138 and 8 for DRG 139.

Table 2 also depicts the demographic breakdown of the cases included in the study. The mean age of

patients was 64 years and 59 years for DRG 138 and 139, respectively. Males outnumbered females in both DRGs: 13 and 8 respectively for DRG 138; 40 and 25 respectively for DRG 139. Not shown in the table is the fact that military sponsors (active duty or retired individuals) accounted for 60 percent of the cases.

For all cases included in the study, LOS (Table 3) varied from one day to thirty days. Within DRG 138, LOS varied from 1 day to 30 days, with a mean of 6.4 days including outliers. Excluding high NCH outliers (two cases, one for 18 days and one for 9 days), the mean LOS for DRG 138 was 6.1 days. For DRG 139, the LOS varied from 1 day to 29 days, with a mean of 3.6 days. DRG 139 had no high NCH outliers.

Mean NCHs per patient day were quite similar between the two DRGs (Table 2). Removal of the outliers from DRG 138 lowered the mean NCHs from 11 to 8.5 hours. Total NCHs and acuity varied much more than the mean NCHs. Total NCHs averaged 73.9 hours for DRG 138, with an average acuity level of 353. DRG 139 averaged 27.5 total NCHs and an average acuity level of 129. Removal of the outliers (by NCHs) from DRG 138 resulted in an average of 40.4 total NCHs and 191 acuity level, effecti·ely reducing the variance between the two DRGs.

Statistical Analysis

Statistical analysis included determination of the mean, median, mode, standard deviation and coefficient of variation for each of the diagnoses within the two DRGs being studied. Cases were then aggregated under the appropriate DRGs and a correlation matrix completed for age, LOS, mean NCHs, total NCHs, and acuity level.

Age and LOS were not found to correlate with diagnoses, DRG, NCH (mean or total), or acuity at a significant level. Total NCHs was found to be highly related to acuity with a correlation coefficient of .9987 with a .01 level of significance. Total NCHs and acuity were found to be strongly related to mean NCHs with correlation coefficients of .5545 and .5618, respectively, with a .01 level of significance.

Within each DRG, total NCHs were also found to be statistically significant at the .01 level with correlation coefficients of .9967 and .9991. In DRG 138, LOS was found to be strongly related to total NCHs and acuity with coefficients of .6501 and 6409, respectively, at .01 level of significance. DRG 139 revealed similar strong relationships. In addition, DRG 139 demonstrated a strong relationship mean NCHs, total NCHs, and acuity.

Analysis of mean NCH distribution revealed no evidence of a bi-modal distribution for either DRG. Of the 21 cases within DRG 138, five were distributed to the right of the bell curve. The five cases were not grouped together or far enough from the bell to give a bi-modal appearance. DRG 139 was normally distributed.

Discussion

Analyzing NCHs required at the diagnosis level,
within DRGs, is fundamental to assessing the validity
of the DRG classification system in relation to
prediction of workload. The Birch and Davis study
provided baseline information from which to begin
further in-depth research of potential problem areas,
such as the bi-modal tendency in DRG 138. Sample sizes
in the Birch and Davis study were 70 for DRG 138
(including four outliers with NCHs required
approximately four times greater than the mean) and 65
for DRG 139 (no outliers found).

Utilizing the same data fields, this study
replicated the Birch and Davis study to analyze nursing
care requirements at the diagnosis level. Though
strong correlations were found between mean NCHs, total
NCHs, and acuity for both DRGs, the results of the
study did not reveal significant variations within the
DRGs. DRG 138 sample size (approximately one third
that of the Birch and Davis study) could be one reason
that bi-modal representation within the group was not
found. For the cases included, outliers within DRG 138
appear to represent the fact that some illnesses
require more intense care and longer in-hospital
treatment and convalescent phases than others. The

only outlier identified for DRG 139 actually belonged in DRG 138, as further research revealed.

Current practice within USAF MTFs appears to be to use a DRG grouper only on those cases which are so complicated that classification cannot easily be completed by a trained records technician/coder. The Birch and Davis study analyzed cases from FY 89 and earlier. Use of DRG groupers at most military MTFs was minimal during that time frame. Diagnoses and procedures were coded by facility personnel and input into local computer information systems which were later uploaded into RCMAS for aggregation and reporting. It is feasible that some incomplete records were coded and entered based on available information, thereby resulting in incorrect DRG classification within the RCMAS. If this occurred, it could result in some mis-classified cases.

Birch and Davis was also charged with assessing the potential use of DRGs for estimating nursing manpower requirements at military MTFs. Their study revealed that NCHs based on the WMSN/DRG model are sufficiently accurate to use in allocating nursing manpower within certain constraints (Birch & Davis, 1990). This study provides further evidence of the accuracy of associating NCHs with DRGs and supports the

theory that DRGs can be used as predictors of nursing manpower requirements.

Properly associating NCHs with DRGs could provided healthcare financial officers and executives with further information about the expense of providing nursing care. In light of recent efforts to implement product line management within the healthcare industry, information about mean NCH requirements per DRG and current or future salaries can be used to compute more accurate budgets. It may also be used to assess variances among various groups of nursing personnel and their productivity as it relates to providing care to specific groups of patients. However, prior to undertaking any of activities such as these, it is important to assess the accuracy of nursing workload data collection and aggregation by completing an in-depth review of the entire patient classification and data collection system in use.

Conclusion and Recommendations

Analysis of the required nursing care hours associated with specific DRGs is necessary to determine that the classification process fairly represents all variables under consideration. Use of a classification system, such as the DRG system, to assess anticipated workload is essential under a prospective payment system. However, it is equally essential to perform in-depth analysis of the variables to determine fair representation of each.

This study of DRGs 138 and 139 did not reveal any significant differences in the nursing care requirements among the cases analyzed. Grouping according to primary diagnosis also did not reveal any significant variations in nursing care requirements. Based on the results found, the following conclusions are offered: (a) that significant variations in nursing care requirements within DRGs do not exist, except in infrequent cases; and (b) once appropriately associated, DRGs are fair predictors of nursing care requirements. These conclusions must be tempered with the knowledge of the small sample size of the DRGs examined in this study. Further study of DRG 138 is recommended to determine whether bi-modal

representation is actually occurring and at what type
of facility.

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Table 1

Population and Sample Sizes

Time Period	Cases	DRG 138 Total	Actual	DRG 139 Total	Other Actual	DRGs
Jan-Feb 91	80	15	4	26	13	39
Mar-Apr 91	64	11	6	20	4	33
May 91	39	7	2	14	3	18
Jun 91	47	2	2	25	25	20
Jul 91	44	7	7	21	20	16
Total	274	42	21	106	65	126

Note 1. Potential cases were obtained from AQCESS based on the primary discharge diagnosis. A DRG grouper was then used to classify each case based upon precoded secondary diagnoses and procedures.

Note 2. Actual cases are those for which acuity data was located for each day of the hospital stay.

Note 3. Actual cases used represents 31 percent of the potential cases and 58 percent of those cases which were grouped in DRG 138 or 139.

Table 2

Analysis by DRG and Diagnosis Code

DRG 138

Diagnosis Code	# of Cases	Mean Age	# of Males	Mean LOS	Mean NCHs/D	Median NCHs	Mode NCHs	Ave TotNCHs	Ave AC Level
4267	0	-	-	-	-	-	-	-	-
4270	2	35	1	1.5	8.8	8.8	-	12.7	59
4271*	3	66	2	10	18.8	16.6	16.6	211.5	1046
4279	1	82	0	5	4.8	-	-	24.2	110
7850	1	75	1	1	16.6	-	-	16.6	80
7851	0	-	-	-	-	-	-	-	-
42731	10	65	6	7.7	8.3	6.7	-	52.2	241
42732	1	73	1	7	10.6	-	-	73.9	336
42741*	1	53	0	9	25.2	-	-	226.4	1089
42769	0	-	-	-	-	-	-	-	-
42781	0	-	-	-	-	-	-	-	-
42789	2	71	2	2	8.4	8.4	-	15.1	70
Total	21	64	13	6.4	10.9	7.7	16.6	73.9	353
Total w/o outliers	19	64	12	6.1	8.5			40.4	191

Note 1.   * Denotes an outlier (by NCHs) in that group.

Table 2 (Cont)

Analysis by DRG and Diagnosis Code

DRG 139

Diagnosis Code	# of Cases	Mean Age	# of Males	Mean LOS	Mean NCHs/D	Median NCHs	Mode NCHs	Ave TotNCHs	Ave AC Level
4267	2	23	2	5	3.7	3.7	-	20.5	93
4270	3	56	1	3.6	7.1	6.8	-	19.4	88
4271	5	47	3	10.8	7.3	6.8	-	65	295
4279	1	64	0	2	3.2	-	-	6.4	29
7850	0	-	-	-	-	-	-	-	-
7851	3	49	2	1	8.7	10.6	10.6	8.7	39
42731	33	64	22	2.8	10.6	10.6	10.6	24.7	119
42732	5	72	3	3.4	11.1	10.6	7.7	37.3	170
42741	0	-	-	-	-	-	-	-	-
42769	1	47	1	2	5.7	-	-	12.1	55
42781	4	61	2	3	7.9	8.1	-	23.7	108
42789	8	57	4	3.5	10.3	10.3	-	27.2	125
Total	65	60	40	3.6	25.1	9.5	10.6	27.5	129

Appendix A

DRG 138 and 139 Diagnoses List

DRG 138:   Cardiac Arrhythmia and Conduction
Disorders. Age over 69 years and/or the presence of
complications or comorbidities.

426 Conduction Disorders

426.0 Atrioventricular block, complete

426.1 Atrioventricular block, other and

unspecified

426.10 Atrioventricular block, specified

426.11 First degree atrioventricular block

426.12 Mobitz (type) II atrioventricular

block

426.13 Other second degree atrioventricular

block

426.2 Left bundle branch hemiblock

426.3 Other left bundle branch block

426.4 Right bundle branch block

426.5 Bundle branch block, other and unspecified

426.50 Bundle branch block, unspecified

426.51 Right bundle branch block and left

posterior fascicular block

426.52 Right bundle branch block and left

anterior fascicular block

426.53 Other bilateral bundle branch block

426.54 Trifascicular block

426.6 Other heart block

426.7 Anomalous atrioventricular excitation

426.8 Other specified conduction disorders

426.81 Lown-Ganong-Levine syndrome

426.89 Other

526.9 Conduction disorder, unspecified

427 Cardiac dysrhythmias

427.0 Paroxysmal supraventricular tachycardia

427.1 Paroxysmal ventricular tachycardia

427.2 Paroxysmal tachycardia, unspecified

427.3 Atrial fibrillation and flutter

427.31 Atrial fibrillation

427.32 Atrial flutter

427.4 Ventricular fibrillation and flutter

427.41 Ventricular fibrillation

427.42 Ventricular flutter

427.5 Cardiac arrest

427.6 Premature beats

427.60 Premature beats, unspecified

427.61 Supraventricular premature beats

427.69 Other

427.8 Other specified cardiac dysrhythmias

427.81 Sinoatrial node dysfunction

427.89 Other

427.9 Cardiac dysrhythmia, unspecified

428 Heart failure

428.0 Congestive heart failure

428.1 Left heart failure

746 Other congenital anomalies of the heart

746.86 Congenital heart block

785 Symptoms involving cardiovascular system

785.0 Tachycardia, unspecified

785.1 Palpitations

996 Complications peculiar to certain specified

procedures

996.0 Mechanical complications of cardiac device,

implant, and graft

996.01 Due to cardiac pacemaker (electrode)

DRG 139: Cardiac Arrhythmia and Conduction

Disorders. Age less than 70, without complications or

comorbidities.

DRG 139 uses the same diagnoses and ICD-9-CM codes

as those listed for DRG 138.

Note. From The international classification of

diseases, 9th revision, clinical modification (ICD-9-

CM) (2nd ed) by Jones, M. K.; Uttenreither, M.; Meisch,

M.; & Arron, W.S. (Eds), 1980 (with all current errata

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Appendix B

Computation of Total Nursing Care Hours

Total nursing care hours are derived directly from summing daily patient acuity. To determine nursing care hours for a particular patient day, a patient category is selected by matching the daily points (calculated by completing the acuity worksheet) with the appropriate point range given below.

Category	Point Range
I	1 to 12
II	13 to 31
III	32 to 63
IV	64 to 95
V	96 to 145
VI	146 to 262

The category is also used to determine the direct care time, expressed in hours.

Category	Direct Care Hours Per Day
I	0.88
II	2.75
III	6.00
IV	10.00
V	15.13
VI	25.50

The category is then matched with one of six ward types to determine the indirect care factor.

Unit Type	Indirect Care Factor
Medical/Surgical	1.761
ICU/CCU/NICU	1.662
Obstetrics	1.778
Psychiatric	1.689
Newborn	1.630
Pediatrics	1.727

The direct care hours and indirect care factors are multiplied together to determine the nursing care hours required to satisfy a particular patient's needs for that patient day.

Note. From Reference manual: Workload management system for nursing by the Joint Manpower Office, Office of the Assistant Secretary of Defense (Health Affairs) 1989, Rockville, MD: U.S. Government Printing Office.