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# Development of a Computerized Patient Classification and Staffing System

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*Korean health care agencies are trying to find ways to survive amid strong competition within the health care industry and pressure to open health care market from abroad. One way to survive is to improve health care quality at present or reduced expenditure. Nursing is the largest manpower in health care agencies and plays an important role in determining quality of care through direct interaction with patients., thus, nursing manpower management is an essential part of survival strategies. If the nursing department can adapt to dynamic changes in the health care environment in terms of quality and quantity of service needed, health care agencies' quality and efficient management will be achieved at the same time. A computerized prototype patient classification and nursing staffing system was developed using Microsoft Visual Basic 3.0. This system allows a user to use GUI(Graphic User Interface) with an icon and a mouse. By applying this computerized system to clinical practice, nursing managers will receive accurate information regarding nursing manpower management at nursing unit level as well as departmental levels. Then nursing managers can achieve effective nursing manpower management, which will improve nursing care by allocating more nursing staff time to direct patient care.*

## Introduction

Demand for health care services in Korea has increased dramatically since the national health insurance system began to cover the entire Korean population in 1989. This high demand for health care services pushed Korean businesses into constructing a large number of 1,000 and 2,000-bed hospitals in the mid-90's. This lead to strong competition within the health care industry. Another factor which has great impact on Korean health sector is the pressure from the advanced countries to open health care markets. Health care agencies are trying to find ways to survive under this strong competition within the health care industry and pressure to open their market to the advanced countries.

One way to survive is to improve health care quality at present or reduces expenditure. Health care quality can not be improved when workload and staffing resources are not properly balanced. Since nursing manpower consists of at least one third of the total hospital manpower and plays an important role to determine the quality of care through direct interaction with the patients, management of nursing manpower is an essential part of the survival strategies by health care agencies.

Health agencies in the advanced countries have used in-house and commercially-developed patient-classification systems to quantify the nursing workload.[1,2,3] Furthermore computer programs have been implemented to allocate available nursing personnel among nursing units according to the measured nursing workload.[4]

Currently in Korea, nursing staffs are allocated based on the medical law which requires health care agencies to staff a minimum of 2 nurses for every 5 in-patients. Nursing administrators at departmental levels make most of decisions about staff utilization based on this criteria. This method does not reflect the fluctuations in daily demands for nursing time, which usually results in too few staff to provide quality care

Recently, efforts to use patient classification to assess nursing care needs and determine nursing staffing requirement based on nursing care needs are being made in large hospitals in Korea. However, manual patient classification requires much time and effort to achieve the desired result. Development of a computerized system can reduce inefficiency of manual work and allow systematic staff management.

The purpose of this study was to develop a computerized patient classification and staffing system to determine the need for nursing staff based on degrees of daily patient dependency on caregivers. The scheduling system which is a part of this system is not going to be discussed in this paper. This system can serve as a data-gathering tool to identify quantitative nursing demands for each nursing unit. Once implemented fully, nursing managers will receive accurate information regarding nursing staff requirements at a nursing unit level and departmental levels in timely fashion so that they can achieve effective nursing staff management. This will, in turn, improve nursing care by allocating more nursing staff's time to direct patient care.

**Research method**

A prototype patient classification system developed in Korea[5] was used for this study. In order to estimate nursing staff requirements, total nursing care need had to be assessed. Total nursing care need is the sum of total direct care hour and total indirect care hour, which is computed by multiplying the number of patient in each category by the average time used in caring for a typical patient in each category. Total nursing care need then translates into number of nurses who are needed to provide care for the patients by dividing by the average Korean health care agencies are trying to find ways to survive amid strong competition within the health care industry and pressure to open health care market from abroad. One way to survive is to improve health care quality at present or reduced expenditure. Nursing is the largest manpower in health care agencies and plays an important role in determining quality of care through direct interaction with patients, thus, nursing manpower management is an essential part of survival strategies. If the nursing department can adapt to dynamic changes in the health care environment in terms of quality and quantity of service needed, health care agencies' quality and efficient management will be achieved at the same time. A computerized prototype patient classification and nursing staffing system was developed e working hours per day. The need for nurses shift-by-shift is determined based on the workload of each shift.

In this system, patients are classified into four categories: minimal care; moderate care; extensive care; and intensive care. In each category eight care descriptors(nutrition, hygiene, exercise/activity, medication, observation/measurement, communication/ consciousness, test/treatment, and teaching/emotional support) are used to highlight the level of care needed by a patient in that category. Each area has four categories based on the degree of patient dependency on caregivers. For example, descriptions for the element "exercise/activities" varied from one category to the next, as follows:

Category I(minimal care): Can perform active exercise, need position change;
Category II(moderate care): Can perform exercise and activities with partial help or aides;
Category III(extensive care): Need passive exercise. Can change position with help;
Category IV(intensive care): Need absolute bed rest. Can not change position alone;

Frequency of each category is counted over eight areas. Patient is classified into one category having the highest frequency. If a patient has the same frequency in more than two categories, the patient will be assigned to the higher category.

The average direct and indirect care hours per patient-day in each category used for this study were taken from previous time and motion studies conducted in Korea. According to Chang,[5] average direct care hours for classes I, II, III, and IV medical patients in the tertiary hospitals were 2.8, 4.3, 5.5 and 6.1 hours, respectively. Average care hours for classes I, II, III, and IV surgical patients were 2.0, 3.3, 4.5 and 6.1 hours, respectively, Lee and Park[6] found that the average direct care hours for classes I, II, III, and IV patients in Neuro-surgical units were 3.2, 3.9, 5.1 and 6.2 hours, respectively, and class I, II, III, and IV patients in Orthopedic-surgical units were 2.0, 2.5, 3.5 and 5 hours, respectively. Average indirect care hours were 44.5 minutes for medical patients and 46 minutes for surgical patients.

The number of hours a nurse works per day is assumed to be eight hours based on three shifts per day. Another assumption was that there was no difference between the days of weeks in terms of patient care needs based on a previous study.[7] The ratio of nursing staff requirements among three shifts was assumed to be 40%; 35%; 25% based on previous studies .[5,7,8,9,10]

The system was written by Visual Basic 3.0 on the IBM Personal Computer platform. For the convenience of users, it utilized the Graphic User Interface and menu. The system supports a mouse to reduce the key strokes.

**Result**

The patient classification and staffing system developed for the study is composed of five different parts or programs, which can be displayed on a menu or list of available functions. They are introduction of the system, basic data management, patient information management, query, and printout. Using these programs each nursing unit can manage its own patient classification and staffing system.

Main screens for the system are as follows.

1) Introduction of the system

2) Basic data management
. code management for department and nursing unit;
. input direct and indirect nursing care hours by patient class and nursing unit;
. input number of staff scheduled to work for each nursing unit;

3) Patient information management
. input patient demographic information;
. classify patient based on care needs;

4) Query
. query basic data and patient classification information and display on screen;
. display of any of outputs on screen;

5) Printout
. daily unit staffing report showing patient/workload summary and staffing summary
. staffing summary only;
. computed staff requirement based on patient classification along with assigned staff or computed staff requirement based on classification and the required staff by medical law;
. patient classification summary report showing number of patients in each class;
. monthly reports;
. various statistics on patient classification;

Each patient is classified daily by the assigned nurse. Patients are reclassified if the type and amount of care needed changes significantly during the twenty-four hours. Data input ideally takes less than 1.0 minute per patient. This system takes into account nurses' direct care activity time and indirect care activity time for estimating staffing needs. Direct care activity time and indirect care activity time are based on a calculated minutes/patient/day derived from extensive studies done on each clinical unit. A report that indicates staffing needs is generated at least daily on the nursing unit and in the department office. The system is currently used as a data-gathering tool to identify quantitative nursing demands for individual units. In the future, the system can be used to help allocate the PRN (personnel who works when needed) and float personnel .

The system is written by Visual Basic 3.0 and runs on an IBM personal computer. For the convenience of users, it utilizes the Graphic User Interface and Menus, and supports a mouse to minimize the key strokes. Currently, system is in operation at an university hospital in Korea. It is too early to evaluate its performance at this time.

## Discussion

The system classifies patients and produces needed nursing staff to care for patients based on patient classification. A prototype classification system was used, because it requires less time to use than a factor system. Since this system compares patient classification with assigned staff as well as required staff by Korean medical law, it can help nurse managers to manage the budget and hiring effectively. Also, using statistics, nurse managers can allocate floating personnel well. This system was developed based on information collected in one university hospital in Korea. Standardization of the patient classification method needs to be developed for dissemination of this system to other hospitals. Further studies are necessary concerning the workload ratio of the three shifts in different situations and nursing staff demand by the days of the week. Continuous studies are necessary to develop criteria for staffing various nursing personnel.

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