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Medication administration by non-registered nursing personnel : a safe and cost effective way to reduce the shortage of registered nurses

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MEDICATION ADMINISTRATION BY NON-REGISTERED NURSING PERSONNEL:

A SAFE AND COST EFFECTIVE WAY

TO REDUCE THE SHORTAGE OF REGISTERED NURSES

An Independent Research Project

by

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MEDICATION ADMINISTRATION BY NON-REGISTERED NURSES:

A SAFE AND COST EFFECTIVE WAY

TO REDUCE THE SHORTAGE OF REGISTERED NURSES

Introduction:

The purpose of this study is to demonstrate the efficacy of, and necessity for, assigning the technical tasks of medication administration to non-Registered Nursing (non-RN) personnel in light of the continuing Registered Nurse (RN) shortage in the acute care setting and our rapidly changing and financially unstable health care environment.^{1,2}

Investigative results will prove that medication administration in the acute care setting can be handled in a safe and cost effective manner by non-RN personnel to the extent that:

1. RN resources will be better utilized;
 2. acute care institutions will save money by avoiding unrestrained spending related to scarce RN resources (recruitment costs, agency use costs, orientation costs due to high attrition, and frequently increasing hourly wages); and
1. institutional quality will be improved, thus increasing the facilities chances of long term survivability in the market- place.

BACKGROUND/LITERATURE REVIEW

It is now common knowledge that the health care industry in the United States (US) is in a period of instability as demonstrated by numerous hospital closures; health care costs

rising at an alarming rate; and chronic shortages of licensed health care providers, particularly nurses. The literature is rife with information about the reasons for this; what may happen next; and how this will impact on the health care of every individual in the US.

Americans spend an increasing proportion of their income and the state and federal governments spend an increasing percentage of our tax dollars on health care. While our percentage of Gross National Product exceeds that of all other countries (13% in the United States, 12% in the United Kingdom, and 10% in Canada), our infant mortality rate is still higher than most industrialized nations, and our overall mortality rate is higher than most other developed countries.³ A myriad of factors is responsible for this situation, but the most notable include:

1. Unprecedented and expensive technological advances in medicine, eg. organ transplants, lithotripsy, laser surgery,
2. The Medicare and Medicaid Programs funded by the federal and state governments respectively,
3. Changes, ie limitations, in reimbursement policies by medical insurance carriers and the introduction of diagnosis-

related groups (DRG) by the Federal Government,⁴

4. The "graying" of America, resulting in an increasing proportion of the population that will be heavy users of health care resources,⁵ and

5. Human resource deficits, especially in the pool of available RN's, previously the largest and least expensive source of professional labor in acute care hospitals.⁶

The last factor is, at this time, the only one which can be directly addressed by the management of an acute care hospital.

Therefore, a brief discussion regarding the state of professional nursing today and how its shortage in the marketplace can be attenuated by utilizing other health care personnel for various nonprofessional tasks, will provide a rationale for the hypothesis of this paper.

Nursing: Past and Present

The evolution of nursing in America has closely paralleled that of medical science. For example, prior to the advent of critical discoveries in the twentieth century (insulin, antibiotics, X-rays, etc.) nursing was largely confined to measures that supported the physician's rudimentary attempts at healing - nutrition, cleanliness and comfort. Education for nurses was limited to practical on-the-job training; however, as the field of medicine became more sophisticated, so too did the nurses role, and nursing education became hospital-based and standardized (the diploma in nursing was available after three years). Hospitals

capitalized on the use of this inexpensive source of labor (students), and were not required to pay nursing supervisors much either, due to nursing's charitable and religious overtones.

Nursing: 1940's

The 1940's saw a change in nursing. World War II helped to raise the standard of the profession as it was discovered during war time that nurses could take on many responsibilities previously handled only by physicians. In addition, colleges began offering degrees in nursing and this began to change the primary source of education for nurses from the hospital to college and university settings.

Nursing: 1960's

The 1960's saw the beginning of rapid technologic development in health care. RN's were in short supply due to a sudden high demand from the health care industry. This resulted in the development of a second category of licensed nurse, the licensed practical nurse (LPN). The LPN role was based in large part on the role of the medic in the armed forces and expanded due to the RN shortage. Since it took three to four years to graduate an RN who was now more highly skilled than ever before, the LPN was a welcome answer to the RN shortage. LPN training lasted only nine to twelve months and functions varied from institution to institution, but the LPN always worked under the supervision of the RN.

Nursing: Shortages

Since the 1960's, health care has experienced cyclical shortages of RN's. During periods of shortages, salaries increased, thus attracting more people into the profession, including a few men. Shortages also led to greater utilization of LPN's. Associate degree programs (two years in duration) leading to the RN grew during the late 1960's and 1970's and are still quite popular today due to the reduced length of time needed to become an RN. Students graduating from nursing schools, regardless of the length of training, must pass the same State Board of Nursing RN licensure examination.

The outcome of all this is a fragmented educational system that has been largely driven by economics. This sensitivity to the health care market has not served nursing well, and has probably contributed to the RN dilemma the American health care system faces today.

Nursing Shortage Impact on Hospitals

The changes in nursing education have had a significantly negative impact on hospitals as the hospital-based schools of nursing closed in favor of the growth of two year university-based education. Hospitals no longer had a large pool of free nursing labor. The interest in university or college level education developed as women (the profession has traditionally been considered feminine and has not been able to attract many men)

sought to "legitimize" nursing as a profession and used academic means to do so.

Nursing Education Dilema

The nursing profession itself is internally divided regarding the RN entry into practice issues. Non-baccalaurate degree nurses seem to believe that "an RN is an RN" regardless of education while nursing leaders and educators seem to feel that the requirement for entry level should be the Bachelor of Science in Nursing degree (BSN). In the 1960's and 1970's, BSN's were prepared primarily for a leadership role rather than the staff or direct care giver role. The large cadre of LPN's and ancillary staff needed the supervision of clinically competent RN's who were in shorter supply and were more thoroughly educated. At this time, the nursing profession began questioning its professional image and defining its roles in health care. The American Nursing Association (ANA) stated that, by 1985, the education required for entry into practice should be the BSN. This recommendation was never implemented nationwide and the issue is still hotly debated.⁷ There are now diploma (three year) nurses, associate degree (two year) nurses, and BSN (four year) nurses, all of whom are RN's.

About the time the last shortage abated in the late 1970's, nursing leaders began scrutinizing how health care delivery systems operated in the acute care setting. Alternative models of nursing practice were developed by academicians and nursing researchers,

based on the belief that the quality of patient care would improve if mostly, or all RN's were directly giving that care.⁸ Thus, the primary nursing care model became most desirable for hospital administrators who embraced the idea that an all RN staff could raise the quality standard particularly given the fact that there were many RN's available. LPN's and ancillary staff began to be utilized less in acute care settings, and more in nursing homes. Hospitals thus began to lose their least expensive source of licensed nurses. RN salaries then began to escalate rapidly as the demand for RN's increased dramatically. Hospital administrators believed they could attract customers (patients and physicians) with an all RN nursing staff. Many hospitals hired consultants to organize RN care delivery systems.

Primary Nursing Care as a Response

Primary nursing requires that the RN care giver be responsible for all aspects of the patient's care, i.e. hygienic, nutritional, therapeutic, emotional, as well as medication administration, assessments, documentation, coordinating activities with other ancillary departments, and planning care. The "team nursing" concept that was popular during the 1960's and 1970's was, in many places, discarded. The team concept advocated using different levels of personnel for performing these tasks, some of which did not require a licensed person but which could be performed under the direction of an experienced RN who was ultimately responsible for the care given to the patient.⁹ This was an improvement over

the old functional nursing concepts used in the 1930's to early 1980's, which broke patient care into clearly defined tasks assigned to numerous workers, with only the head nurse accountable for the quality of the care. Modular nursing, an off-shoot of primary nursing, was developed in the latter part of the 1980's in response to the latest nursing shortage. This model allowed for the use of LPN's and nursing assistants within a module (a geographical area of a nursing unit). The module leader is always an RN. This care delivery model is workable where the physical environment is organized into small subunits which are fully stocked with all necessary patient care items.¹⁰ Usually each subunit consists of a small number of contiguous patient rooms which have storage areas containing all the medical supplies commonly used on those repective patients.

The Nursing Shortage: 1987 to Present

Careful investigation has revealed that this most recent shortage is different from past nursing shortages and more dangerous. If there are more nurses working than ever before, why is there such a significant shortage? Several factors are responsible.

1. Increasing patient acuity, ie patients admitted to hospitals are sicker than ever before (medicine is now able to salvage those who previously would have died, thus prolonging lives with complex medical problems often remaining).¹¹ This trend, likely to continue into the foreseeable future, also has a direct

relationship to the increased expectations of physicians and health care consumers who are demanding more " hi-tech" care and expertise in handling sophisticated diagnostic and treatment modalities.¹²

The net effect of this is resulting in higher stress levels among the experienced nurses already in short supply, in a faster burn-out rate, and fewer nurses remaining in the acute care setting for any length of time. The long term overall effect is the reduction and productivity of acute care nurses who are struggling to give "total care" to larger groups of patients without much ancillary (unlicensed) support.

2. Nursing has traditionally been a "female profession" with a lengthy, nonpaying hospital-based apprenticeship. Therefore the nursing profession has been poorly paid and the salaries have increased at a lower rate than salaries for other desirable jobs. The women's movement of the last 25 years has also encouraged young women to enter higher paying and more prestigious work such as law, medicine, and business.¹³ Because fewer women are entering a profession which has been hard-pressed to demonstrate its professional status by standardizing education, entry level and roles, many schools of nursing on all educational levels have been forced to close. The salary issues continue to impact on practicing nurses. Many nurses have been lured away from the hospital by the more glamorous health care businesses involved with lucrative equipment sales and other of health care service industries.

Dealing With Nursing Shortages

Innovative benefit plans are being developed for RN's to encourage them to remain in the profession as well as to aid in the recruitment of such personnel. Some of these plans are:

- . flexible scheduling and pay practices, e.g., working two twelve hour shifts on the weekend and being paid for forty hours of work;
- . job sharing, e.g., two nurses sharing one full time equivalent position;
- . menu-type benefit options;
- . paid continuing education;
- . child care programs with generous discounts for employees;
- and
- . profit-sharing programs (in for-profit hospitals)

Recognition programs have taken on heightened importance. There are now nurse recognition days/weeks which are usually accompanied by special meals, testimonials, press releases, gifts, etc., which are generally paid for by the employer. Employee of the month programs have also gained in popularity. The programs emphasize the recognition of specific people at regular intervals and such awards are accompanied by bonus pay, special parking privileges, free meals, press releases, etc. Also, there are special reward or incentive programs which include a bonus for recruiting other RN's, and this seems to have been quite effective. In addition, there have been career ladders developed within respective nursing programs which provide nurses with upward mobility and associated

improved compensation with each promotion.¹⁴

Among the programs which are presently in use are the retention incentive programs. These programs usually allow nurses to actively participate in the decision making processes which affect the nurse in his/her job, e.g., collaborative practice, and staff committees. Employee assistance programs are made available to deal with family counselling and other types of problems. Nurses are also guaranteed a minimized amount of floating among nursing units. This has the advantage of giving the nurse a sense of job stability and reasonable chance of becoming familiar with the patients assigned to her.

In general, there has been a continuing effort by hospitals to empower the nurse, to heighten self-esteem and professional pride. At times, nurses on specific nursing units may be given the opportunity to reorganize their nursing care delivery system. This might include altering the nurse staffing mix or entirely changing nursing practice methods. This flexibility within the constraints of reasonable practice have been beneficial in retaining RN's.

3. Changes in the reimbursement system to hospitals (for example the Diagnosis Related Groups (DRG's), capped patient charges, limits on lengths of stay by federally and privately funded insurance programs, etc.) have resulted in a reduction in profits for health care institutions which, in turn, have forced hospital administrators to make all aspects of their operation more

productive, more efficient, and less costly, without sacrificing the provision of safe patient care. This has impacted on the nursing labor force by prompting administrators to try a variety of ways to reduce nursing services without sacrificing quality of care. This has usually resulted in the elimination of nursing support services, placing total patient workload on the RN.

Until very recently, many hospitals believed that an all RN staff would be more efficient, and would accomplish the same work as nursing support services in less time. What has actually occurred is an unwillingness among RN's to place themselves in high stress positions with no support services. Administrators are now beginning to recognize the folly of requiring experienced professional personnel to implement care which could be safely and efficiently done by lower cost personnel, with adequate supervision. This final concept is critical - just as an attorney does not research and write every brief without the assistance of a law clerk, so, too, nursing professionals should not have to accomplish every nursing task without the assistance of qualified support staff. The key is proper utilization of all levels of staff, with the understanding that it is as important to learn the management techniques to deliver and delegate care, as it is to master the clinical skills necessary for "high tech" care.

The RN's role in Case Management and Managed Care is evolving from that of a technical role to that of a true leader who

delegates the workload to a variety of unit-based care givers, some of whom may be licensed and others unlicensed. This evolution has, in part, been fueled by the necessity for RN's to be providers of "high tech" nursing care as medical technology has continued to explode onto the health care marketplace. Health care consumers, as well as physicians, expect RN's to meet this challenge and to be able to provide this kind of "high tech" nursing care to their patients at any time of day or night.

Drug Distribution Systems and the Nurse

Since nurses must invest time and energy in the process of obtaining, administering, and accounting for medications within the constraints of a formal drug distribution system, it is necessary to provide a description of the various drug distribution systems as they relate to the medications administration process. There are three general types of medication distribution systems, and they are:¹⁵

- . the traditional system,
- . the unit-dose system (UD), and
- . the combination of both traditional and UD.

The Traditional System

The traditional system comprises a predominately floor stocked medication system in which medications are dispensed in bulk quantity based on a prescription written for each drug a patient

needs. The bulk supply of medications would normally represent the quantity of medications that would last throughout the patient's stay. It is stocked on the nursing unit for use by the nurse whenever the patient needs the drug. Once the drug was discontinued, it would be discarded because it could not be reused for another patient. This resulted in expensive, but necessary, wastage. This system is the most manpower intensive to operate and is one of the most expensive to maintain. This system predominated in acute care facilities through the mid-1970's until it was generally replaced by a combination of both the traditional and the unit-dose systems, either of which were improvements in patient safety and drug security.¹⁶

The Combination System

The combination system consists of medications which are dispensed in unit-dose containers.¹⁷ These containers are packages containing single doses of the medication which are individually labeled regarding content, lot number, expiration date, and name of manufacturer. However, these unit-dose containers are usually dispensed for multiple days, and are often used in the same way as the traditional bulk stock systems. The unit-dose system itself was designed to be a twenty-four hour maximum stock which would be maintained on the nursing unit for each individual patient. The advent of unit-dose containers added an element of safety for the patient in that the pharmacist prepared these doses prior to the patient needing them and,

therefore, avoided opportunities for medications administration personnel, who for the most part were licensed nurses, to make mistakes in such preparation.¹⁸

The Unit Dose System

Since the mid-1970's utilization of the unit dose concept has increased in most health care facilities, primarily due to the increased control and accountability of drugs which this system provides as well as reducing the wastage of medications on nursing units.¹⁹ The medications being stocked in individual, sealed containers may be returned to the pharmacy to be reused on other patients, whereas the bulk stock medications had to be destroyed due to their having been handled whenever a medication had to be administered. Lastly, there was an increased safety benefit through reduced medication errors when unit-dose medications distribution systems were used, and this has been well documented since the 1960's.^{20, 21} This system has found increasing favor among hospital managers, both hospital administrators as well as the manager clinicians. The degree of safety was determined to be approximately an eight-fold difference with the unit-dose medications system generally producing one-eighth the number of errors as a more traditional bulk stock system.²²

Statutory and Regulatory Requirements

All of the health regulatory boards and other legal entities throughout the USA require licensed nurses to be primarily

responsible for the safe and effective administration of medications on nursing units with most states allowing some latitude in how licensed nurses achieve this end. Some states will allow unlicensed medications administration personnel to administer medications providing they are adequately supervised by licensed health care professionals.

Current Role of the RN in Medications Administration

The current role of the RN in the medications administration process consists of several major components:

- . legal responsibilities,
- . the Five Patient Rights,
- . unit-based leadership role,
- . patient assessment role, and
- . educational requirements.

The nurses' legal responsibilities are both statutory and regulatory. The federal government as well as the state government provides laws for both the Nurse Practice Act and the Drug Control Act. These Acts generally delineate the nurses' role within the nurses' legal responsibilities.²³ The Health Regulatory Board of the Commonwealth of Virginia outlines the specific responsibilities of the nurse, including those involving medications.²⁴ Virginia is one of the states which does allow the use of unlicensed medications administration personnel (UMAP), provided they are supervised by a physician or a pharmacist.²⁵

The Five Patient Rights of Medication Administration

The nurse's role in the Five Patient Rights for assuring safe and effective medication administration is crucial in the provision of health care.²⁶ These Five Patient Rights are:

- . Right Drug
- . Right Time
- . Right Route
- . Right Frequency
- . Right Dose

Any medication distribution system or any medication administration system must incorporate these Five Patient Rights so that patients receive their medications as intended by their physician. The nurse is responsible for assuring that these Rights are practiced even though he/she might not be the individual who is actually distributing or administering the medication, i.e. if the nurse is performing in a supervisory capacity he/she has an obligation to assure the patient that adequate steps are being taken to make certain that these Rights are being practiced. Failure to assure that these rights are practiced has unfortunately resulted in malpractice suits due to patients having been injured by medication misadventures often called medication errors.²⁷

Increasing Patient Acuity

Along with the increasing patient acuity, i.e. hospital patients being sicker now than ever before, and with the necessity to hire "high tech" nursing professionals, there is an increasing

need for nursing to invest its manpower in making critical patient assessments and in providing critical nursing treatments. Many of these nursing diagnostic assessments and treatments require special training and certification which must be periodically updated, and this trend seems to be rapidly evolving. This is pressuring the registered nurse to spend more of her time in these activities and leaving her with less and less time to provide clerical and technical kinds of care.

All of the above-mentioned forces, i.e. the chronic shortage of licensed nurses, the nurse's evolving role, the changing reimbursement environment for health care institutions, and the increasing patient acuity, have caused hospital administrators and nursing managers to look for opportunities to increase RN productivity without sacrificing patient care.²⁸ This has resulted in the development of categories of non-RN care givers to perform more of the technical and clerical tasks which have traditionally been performed by the RN but which did not require an RN to do.²⁹

The Need for RN Extenders

It is generally accepted by hospital and nursing management that there is a need for qualified nursing support employees who do not act as RN substitutes but rather as "RN extenders". Such personnel would perform the technical and clerical tasks which consume so much of the RN's time and energy, and some of these personnel in existence today are:

- . unit secretaries
- . staffing support personnel
- . unit attendants or aides
- . nursing assistants
- . nursing technicians
- . licensed practical nurses (LPN's), and
- . registered care technologists (RCT's).

The Registered Care Technologist

The Registered Care Technologist is a category of health care providers recently proposed by the American Medical Association (AMA) which claims it can produce the equivalent of three levels of nursing by requiring training two months, nine months, or 18 months duration, respectively, of unlicensed personnel who can then perform many of the functions previously provided by RN's. This may result in further fragmentation of the health care team into even more levels of care givers than presently exist producing more inefficiencies, particularly in communication and identification of authority and responsibility. Further, the proposed training may be inadequate to meet physician and consumer demands for more and more high tech and high touch diagnosis and treatment by non-physician personnel. With the potential for fragmentation of care and questionable training, RCT's may exacerbate an already critical nursing shortage by frustrating, and ultimately further dissatisfying, RN's trained in comprehensive bed side care.³⁰ In addition, there may be an increased potential for medical liability

because of questionable training. Hospital administrators substituting RCT's for RN's for the sake of economy may not be getting the same quality of health care worker. The nursing profession believes it is best qualified to address the nursing shortage problem, and other professional societies and organizations in health care should be supportive of them rather than substitutive.

The Medication Technician

With the use of non-RN's, assurances are needed regarding their proper training and certification because RN's are responsible for leading and supervising these employees. There are also legal responsibilities which the RN ultimately has, that their support personnel do not. Given these issues, one of the most unique categories of RN extenders is the medication administration technician (MAT).³¹ The MAT is a concept developed in the late 1960's as a way to extend the use of scarce RN's and thereby keep hospital beds operational. It was employed in both teaching and community hospitals in states which had nursing practice acts allowing their operation.

As a rule, MAT programs were usually managed by the pharmacy because of the legal requirement for pharmacists to be ultimately responsible for the accountability of controlled drug substances, especially narcotics. The respective boards of pharmacy would usually require that pharmacists supervise such programs and would

ultimately hold them accountable for maintaining adequate drug control and security.³² The patient care tasks performed by the MAT's were clinically supervised by both RN's and clinical pharmacists with the RN's leading this effort. This was a natural management hierarchy given the fact that the MAT's were nursing unit-based.

Extensive training in safe and effective medications administration was jointly provided by nursing and pharmacy. The majority of the training was directly supervised by an RN, usually one with a masters degree in education. Both classroom and on-the-job training in all approved methods of medications administration was provided and this usually totaled approximately 480 hours. Upon successful completion of the training program, a certificate was provided to all students.

The Medication Administration Reporting System

The assurance of safe medication administration is the highest priority. One primary measure of safety is the medication administration error rate. A reasonably precise determination of this was possible due to a sophisticated errors detection and reporting system, managed primarily by the pharmacy. The system mandated the reporting, through documentation on a Confidential Incident Report form, of all errors with failure to report recognized errors resulting in immediate termination of employment. Any reported error, however, was used as an educational tool and

not as a cause for disciplinary action. Clinical Pharmacists and Nurse Managers monitored the medication administration process on a random, unannounced basis to assure errors were detected and reported. Any lapse in either detection or reporting due to oversight resulted in the respective MAP being counseled or disciplined, depending upon the frequency of such oversights. It was believed that such attention from management resulted in medication errors being consistently reported.

Landmark Medication Error Studies

A number of landmark medication errors studies have been done over the years pertaining to traditional, floor stock medication distribution systems, unit-dose distribution systems, with both systems employing RN's and the unit-dose system employing MAT's.^{33 34}

These studies have generally shown that unit-dose systems contribute towards a lower incidence of medication errors regardless of which category of personnel are administering medicine. However, results of the available studies indicate MAT programs have accomplished the following:

- . prevented the closure of beds when there were not enough RN's to keep them operational;
- . maintained a lower medication error rate than that of RN's, e.g., 0.64% vs 5.33%, respectively for MAT's vs RN's;³⁵
- . improved productivity of RN's, i.e., the RN had more time to focus on activities which only he or she was wqualified to perform, e.g., patient care assessment and the

formulation of patient care plans;³⁶

- . annual personnel expense savings, i.e., \$50,000 per annum in one community hospital.³⁷

Relatively few studies have been done measuring the differences in RN versus non-RN medication administration personnel error rates.

The Need for a Community Hospital-based Study

A study of the differences between these two categories of health care workers in a unit-dose distribution system operated within an acute care community hospital is needed since most of the studies have been done in hospitals associated with teaching institutions. The results of such a study would provide important information to hospital administrators and nursing managers in determining the relative safety of using less expensive medications administration personnel in their respective facilities.

Despite the logical benefits drawn from such an approach, in the mid-1980's there was a trend to discontinue such programs primarily due to two reasons. The nursing profession desired a change to an "all licensed nurse" concept with the majority of the hospital-based nurses being RN's. Such concepts were usually associated with the "primary nursing care" concept where one RN attempts to provide all care to the patient with no distinction being made between tasks requiring a very high degree of professional skill (for example cardiac monitoring), and those requiring a low degree of professional skill (for example most

medication administration). At the time the published literature on primary nursing care systems claimed it was more cost efficient to use only RN's to provide all types of health care to hospitalized patients, including medications administration.³⁵ They further believed that nursing could absorb such tasks as medication administration once an institution's MAT program was discontinued without adding more RN's or increasing expense.³⁶

Since the discontinuation of most of the MAT programs which were in existence in the United States, the many of the nursing departments of the respective hospitals have had to add additional RN's or increase nursing expenses. In the face of a worsening RN shortage, this had the effect of exacerbating the shortage and, therefore, caused an increased usage in temporary or agency RN's with the accompanying high cost of this type of personnel. In addition, the medication error detection and reporting systems were rendered less effective due to the RN's not having the time to invest in supporting such systems. Indicators of medication errors before and after the changeover to an RN-based medications administration system demonstrated a sustained increase in errors after the changeover with only a small proportion of actual errors being reported.³⁷

The Need to Alleviate the RN Shortage and One Hospital's Response

Because it is generally accepted that the RN shortage will continue into the foreseeable future, there is evidence that

hospital administrators and nursing managers are looking for opportunities to minimize the effect of the RN shortage. As a case in point, the University of California at Los Angeles Medical Center administration implementing a MAT program using non-RN personnel such as technicians.³⁸ The technicians are paid at a rate of approximately one-half that of RN's. It is forecasted that this program will be a significant cost savings to the medical center as well as providing an improvement in productivity of nursing activities.

A Study Comparing the Incidence of Medication Errors

Description of the Study

A retrospective study was conducted in a large hospital in a mid-Atlantic state covering one year to compare the incidence of medication administration errors of both RN's and non-RN's (MAT's) as well as to determine whether or not there was a statistically significant difference in the incidence of errors between these two categories of medication administration personnel. One nursing unit, a psychiatric unit, was selected from which the study data was collected. This nursing unit had a relatively stable staff of medications administration personnel, some were RN's and others were MAT's, with only one category of either personnel on duty for any given shift.

Study Methodology

The incidence of medication administration errors was determined for all doses administered. Both categories of MAP used the same twenty four hour supply, unit-dose drug distribution system, as well as the same medication errors detection and reporting system. The error detection system involved self-reporting by the MAP as well as system monitoring by the pharmacists. This involved investigating all requests from the MAP for extra or different doses of medications ordered as well as checking the utilization of medications on the study unit for variations from the physicians' orders. All variations in medication administration from the physicians' orders were documented and this included:

- . Patient Name and Room Number
- . Date and Time of Error
- . Age and Sex of Patient
- . Admitting Diagnosis
- . Description of the Error and Related Circumstances
- . Consequences to the Patient
- . Corrective Action Taken
- . Names of the MAP Making the Error and Reporting the Error.

The data collected for each category of MAP is shown in Table 1. A medication error is defined as any variation from the physicians' order which violated any one of the previously mentioned Patient Rights with an allowance of being within plus or minus one hour of the scheduled administration time being considered "on time".

Statistical Methodology

In order to test the statistical significance of the data, the following hypotheses were developed:

- . Null Hypothesis - There would be no difference in the incidence of medication administration errors between RN's and Non-RN's at the $p \leq .05$ level of significance.
- . Alternate Hypothesis - There is a difference in the incidence of medication administration errors between RN's and Non-RN's at the $p \leq .05$ level of significance.

A test of statistical significance was done on this data using the chi square test. The results of these tests are shown in Table 2. The chi square test determined whether an observed set of frequencies, medication errors, in the 1x2 contingency table shown in table 2 could have occurred when the null hypothesis was true. The chi square formula employed is as follows:

$$\text{Chi Square} = (O_1 - E_1)^2 / E_1 + (O_2 - E_2)^2 / E_2$$

where: O = Observed Occurrence

E = Expected Occurrence

Cost Comparison Methodology

A cost comparison of RN's, LPNB's, and MAT's was made as it was evident that there were significant differences and cost saving opportunities. An example of how this was accomplished is shown in Appendix 1.

Analysis of Data

Incidence of Errors

A statistical analysis of the medication error data revealed a statistically significant difference in the incidence of medication errors between RN's and non-RN's at the $p \leq .001$ level, therefore, the null hypothesis was rejected - a significant difference existed.

Cost Comparison

The personnel expense data was analyzed to take into consideration not only differences in hourly wage between the three categories of personnel, RN's, LPNB's, and MAT's, but also the effect of shift differential and employee benefits. In addition, the training expense was computed for MAT, and this was also factored into the cost savings equation. In summary, using the formula shown in Appendix 1, the annualized cost savings for employing LPNB's or MAT's instead of RN's on the study nursing unit on night shift would have resulted in an annualized cost savings of \$12,143 or \$18,546, respectively.

When proportioning these expense savings to a 300-bed hospital, assuming one medication administration person could administer medications to 25 patients of moderate acuity, it is estimated that the annualized cost savings for substituting an LPNB or a MAT for an RN is \$145,716 and \$291,432, respectively.

Discussion

Of the possible explanations for the difference in incidence of errors between RN's and MAT's, one in particular bears attention. Although RN's and MAT's were functioning as MAP, there was a distinct difference between their job descriptions. The MAT had the job of medication administration as his/her singular concern, but the RN had numerous patient care tasks, one of which was medication administration. Whereas the MAT had medication administration as her basic responsibility and focus of attention, the RN's training and professional responsibilities were of a much broader scope and depth causing her to have to prioritize the tasks of medication administration along with numerous other different and often unrelated tasks. This may have resulted in the RN overlooking, and therefore omitting, doses or having to delay administering doses. The expectations that patients, family members, and other health care workers have of an RN are different than the expectations they have of a MAT, eg. they expect the RN to provide the patient with professional services which only the RN can provide. They expect the MAT to provide them with their medications and the means by which the medications can be administered. When they express a non-medication related need to the MAT, they expect his/her to see that the RN is notified so the RN can get that need satisfied.

On the study unit, the RN's appeared to be pulled in many directions and the pharmacists perceived a higher degree of job related frustration from them than from the MAT's. Further studies will need to be done in order to determine what the causes of the difference were as this study was not designed to determine cause and effect explanations for differences in medication administration errors between the two categories of MAP.

Hospital Management Implications

As stated previously, medication errors resulting in injury to patients can result in malpractice litigation with associated court awards and legal settlements of enormous proportions. This study indicates there is opportunity to reduce patient and hospital exposure to injury and financial losses, respectively, through the utilization of non-RN's as MAP due to their lower incidence of medication administration errors.

The personnel expense data demonstrate the potential for significant cost savings to hospitals through the employment of non-RN's in medication administration jobs. Given the comparative safety of such programs as measured by a lower medication administration error rate and the net income of hospitals continuing to erode due to increasing reimbursement constraints, management should consider such cost saving programs for implementation in their respective hospitals.

CONCLUSION

Non-RN MAP's can be effective and can be practically implemented in acute care facilities which do not have the benefit of management engineers or research funds to do extensive medication administration error studies. There is the opportunity to significantly reduce institutional personnel costs and improve earnings with such programs. With society expecting more and higher quality services, hospital administrators have an opportunity to offer the health care consumer or customer a service of real value - safer and less expensive medication administration services.

TABLE 1

This table shows the number of each type of error by the month in which the errors occurred by RN's and Non-RN's. Also, the total number of doses administered is shown

MEDICATION ERROR DATATime in Months

	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	
<u>Errors of Omission *</u>													<u>Total</u>
<u>RN</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>3</u>	<u>3</u>	<u>1</u>	<u>3</u>	<u>2</u>	<u>32</u>
<u>Non-RN</u>	<u>1</u>	<u>0</u>	<u>2</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>3</u>
													<u>Total</u> 34
<u>Errors of Wrong Time **</u>													<u>Total</u>
<u>RN</u>	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>1</u>	<u>0</u>	<u>1</u>	<u>3</u>	<u>2</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>20</u>
<u>Non-RN</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>0</u>	<u>4</u>
													<u>Total</u> 24

(1) Total Number of Doses Administered = 7,140 (RN = 2,820 and Non-RN = 4,320).

(2) Total Number of Errors by Category of MAP = 59 (RN = 52 and Non-RN = 7). All errors were single dose errors.

* Errors of Omission involve the omission of a prescribed dose.

** Errors of Wrong Time involve the administration of doses more than one hour before or after the prescribed administration time.

TABLE 2

This table shows the various types of errors made on the study unit as well as the chi square for each type plus the total errors to determine whether a statistically significant difference in the number of errors existed between RN's and Non-RN's.

	<u>Errors</u>					
	<u>Omission</u>		<u>Wrong Time</u>		<u>Total</u>	
	<u>O*</u>	<u>E**</u>	<u>O</u>	<u>E</u>	<u>O</u>	<u>E</u>
<u>RN</u>	<u>32</u>	<u>11.55</u>	<u>20</u>	<u>7.92</u>	<u>52</u>	<u>19.65</u>
<u>Non-RN</u>	<u>3</u>	<u>23.45</u>	<u>4</u>	<u>16.08</u>	<u>7</u>	<u>39.53</u>
<u>Total</u>	<u>35</u>		<u>24</u>		<u>59</u>	
<u>X²₍₁₎ =</u>	<u>54.042</u>		<u>27.5</u>		<u>80.028</u>	

Each X² was significant at the p ≤ .001 level

* Observed data

** Expected findings

Appendix 1

Annualized Personnel Cost Savings:

LPNB's Instead of RN's as MAPS-

a General Formula

Annualized personnel cost savings is determined by computing the annual cost of RN's and LPNB's, taking into account their respective hourly wages and all other compensation enhancements and computing the difference between them. For the sake of simplicity, a general formula is shown below:

$$\text{Annual Cost Savings} = \{(\text{MAP FTE's/Yr})(\text{Hrs/Yr/Shift})\} \{ [(\$/\text{RN Hr})(\text{BFC}) + (\$/\text{RN Hr})(\text{Diff})] - [(\$/\text{LPN Hr})(\text{BFC}) + (\$/\text{LPN Hr})(\text{Diff})] \}$$

Note: BCF = Benefit Compensation Factor for Each Job Category

Example

- Given:
- . 300 bed acute care medical/surgical hospital with all patients of moderate acuity (excludes critically ill patients);
 - . Occupied bed staffing per MAP FTE:
 - . Night = 50 . Day = 25 . Evening = 25 ;
 - . Administer all medications except rapid Intravenous infusions (IV push) and intravenous cancer chemotherapy;
 - . Hourly wage:
 - . RN = \$12 . LPNB = \$9
 - . BCF for both RN's and LPNB's = 0.17

. Hourly wage adjusted for pay differentials including shifts, holidays and working every other weekend:

. Day = 1.01 . Evening = 1.17 . Night = 1.22

Using this formula, the annualized personnel cost savings for the hospital is \$337,055.

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