

# A Nursing Evaluation of Unit Dose and Computerized Medication Administration Records

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## ABSTRACT

A nursing evaluation of the unit dose system and a computerized medication administration record (MAR) was conducted to determine satisfaction with and perceptions of the effectiveness of these programs. A Nursing Evaluation Questionnaire was used to document nurses' attitudes towards the new programs. Of 228 questionnaires distributed on eleven nursing units, 152 were returned (response rate 66.7%). Full-time registered nurses represented 73.7% of the respondents, part-time 21% and casual 5.3%.

Of the 152 respondents, 86.6% reported at least "some" time savings preparing and administering medications with the unit dose system, with 57% of this group reporting "significant" time savings. Unit dose was considered a safer distribution system by 82% of the respondents. Almost all of the respondents (99.3%) would choose to work with the unit dose system.

Of the 152 respondents, 86% reported the computerized MAR decreased time spent charting medications administered, with half of this group reporting "significant" time savings. The computerized MAR was considered a safer charting method by 74% of the respondents. All of the respondents (100%) would choose to work with the computerized MAR.

The evaluation indicated the unit dose system and computerized MAR were well accepted by nursing staff and were perceived to be working effectively.

**Key Words:** computerized medication administration record, nursing attitudes, unit dose

## RÉSUMÉ

On a demandé à des infirmières d'évaluer le système unidose et un registre informatisé de l'administration des médicaments afin de déterminer si elles jugent ces programmes satisfaisants et efficaces. Un questionnaire d'évaluation a servi à déterminer l'attitude des infirmières à l'égard des nouveaux programmes. Cent cinquante-deux (152) des 228 questionnaires distribués dans 11 unités de soins ont été retournés (taux de réponse : 66,7 %). Les répondantes sont des infirmières autorisées dont 73,7 % travaillent à temps plein, 21 % à temps partiel et 5,3 % occasionnellement.

Quatre-vingt-six pour cent (86,6 %) des répondantes indiquent que le système unidose entraîne au moins une «certaine» économie de temps lors de la préparation et de l'administration des médicaments et, dans ce groupe, 57 % signalent des économies de temps «importantes». Quarante-deux pour cent (82 %) des répondantes estiment que le système unidose est un système de distribution plus sûr. Pratiquement toutes (99,3 %) choisiraient de travailler avec ce système.

Quatre-vingt-six pour cent (86 %) des répondantes déclarent que le registre informatisé permet de remplir plus rapidement les rapports, et la moitié de ce groupe indique une économie de temps «importante». Soixante-quatorze pour cent (74 %) des répondantes estiment que le registre informatisé d'administration des médicaments est un moyen plus sûr de préparer les rapports. Toutes les répondantes (100 %) choisiraient de travailler avec ce système.

L'étude indique que le système unidose et le registre informatisé d'administration des médicaments sont bien acceptés par le personnel infirmier et perçus comme des instruments de travail efficaces.

**Mots clés:** attitude des infirmières, registre informatisé d'administration des médicaments, unidose

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## INTRODUCTION

The Pharmacy Department of a 399-bed acute care teaching hospital received approval to implement a hospital-wide, unit dose drug distribution system in the spring of 1989. The approval coincided with a hospital expansion

and the move of the department to a new facility. Since unit dose implementation precluded the use of medication tickets, a thorough review of medication charting procedures was carried out by Nursing and Pharmacy. One of the alternatives considered in the re-

view was a Medication Administration Record (MAR) generated by the pharmacy computer (software by BDM Information Systems Limited). Given the potential benefits of the computerized MAR, a pilot project was recommended.

The pilot project of the compu-

terized MAR began on one surgical and one medical nursing unit in June 1989, approximately three weeks prior to the initiation of a unit dose pilot project. The pilot project generated sufficient nursing support to proceed with hospital-wide implementation of the MAR. Implementation of the unit dose system and the MAR began in September 1989 and was completed in April 1990. Initially, implementation of the MAR preceded unit dose implementation by two weeks. However, as experience was gained, the MAR and unit dose system were implemented simultaneously.

A unit dose distribution system provides individually labelled doses of medication to nursing units in a ready-to-administer format on a 24-hour cycle.<sup>1</sup> The primary benefits of the unit dose system include nursing, pharmacy and hospital administration.<sup>2</sup> The system reduces the nurse's medication preparation and administration time.<sup>2-5</sup> Medication preparation and dispensing tasks are centralized in the Pharmacy Department, optimizing the use of human resources. The hospital management benefits include a reduced number of medication errors and lower drug costs due to reduced pilferage, wastage and improved inventory control.<sup>2,6-8</sup> The unit dose system enables Pharmacy Departments to meet professional and accreditation "standards of practice", enhancing patient care roles. Although the unit dose system was first introduced into Canadian hospitals two decades ago, by 1991 only 19% of hospitals reported implementation of the system.<sup>9</sup>

The reported benefits of the computerized MAR include a reduction in nursing charting time, the production of a standardized and legible document and a re-

duced number of medication errors.<sup>10</sup> Although 75% of Canadian hospital pharmacies use computer systems for inpatient drug distribution, by 1991 only 35% reported implementation of the computerized MAR.<sup>9</sup>

Evaluations of unit dose systems and MARs include quantitative and qualitative criteria. Quantitative evaluations may include pre- and post-implementation comparisons of drug costs, drug wastage and nursing time spent on medication preparation and administration. Qualitative evaluations may include a comparison of pre- and post-implementation medication errors, effectiveness and pharmacy, nursing and physician attitudes.<sup>2</sup> This study was a qualitative post-implementation evaluation that assessed nurses' satisfaction with these programs and perceptions of their effectiveness.

## METHODS

An evaluation questionnaire\* was used to document nurses' attitudes towards the unit dose system and the computerized MAR. The questionnaire was developed jointly by Pharmacy and Nursing. Two types of questions were used. Questions using a five-point Likert scale assessed nurses' satisfaction with the programs. Open-ended questions assessed nurses' perception of the effectiveness of the programs and enabled nurses to provide specific feedback and comments.

The pilot testing of the questionnaire was carried out in October 1990 with 20 nurses representing all nursing units to be involved in the evaluation. A one-page cover letter explained the purpose of the evaluation and encouraged nursing participation. Nurses participating in the pilot test were given two weeks to return the questionnaire. In addition to requesting feedback

regarding the questions, each pilot participant was asked to provide the amount of time required to complete the questionnaire and the amount of time nurses should be given to return it. The feedback from the pilot test was incorporated into the questionnaire and the cover letter. The time to complete the questionnaire ranged from 15 to 30 minutes. The pilot participants felt nurses should be given three to four weeks to return the questionnaire.

Questionnaires were distributed in November 1990, six months following the completion of hospital-wide implementation of the unit dose system and the computerized MAR. Nurse Managers on each unit were asked to distribute the coded questionnaires to their nursing staff at a staff meeting and encourage their staff to respond. Questionnaires were provided to the Nursing Office for casual and part-time nurses. Nurses were given four weeks to return completed questionnaires to their Nurse Managers or the Nursing Office. Nurse Managers returned completed and extra questionnaires from their nursing units to the Pharmacy Department.

Data were analyzed using the statistical package BMDP for the personal computer (BMDP Statistical Software Inc., 1991). Mean Likert scale scores were calculated. Descriptive statistics and trend analysis were used in the interpretation and discussion of the study data. For differences between groups, Analysis of Variance was performed. The level  $\alpha = 0.05$  was selected for statistical significance.

## RESULTS

A total of 228 Nursing Evaluation Questionnaires were distributed to individual nurses on eleven nursing units. An overall response rate of

\* A copy of the questionnaire may be obtained from the first author.

66.7% (N=152) was achieved. The response rates for the individual nursing units ranged from 45.5% to 100%. Full-time registered nurses represented 73.7% of the respondents, part-time 21% and casual 5.3%. Almost half of the respondents (44.1%) had worked less than two years at the hospital, 14.4% from two to five years, 21.7% greater than five to ten years and 19.8% greater than ten years.

Prior to their experience with the unit dose system, 90% of the respondents had worked with an individual patient prescription system. The unit dose system was previously encountered by 46.4% of the respondents. Prior to the MAR implementation, 90% of the respondents had worked with a manual MAR and medication tickets. Only 17.4% of the respondents had previously worked with a computerized MAR.

### The Unit Dose System

Nursing attitudes on the impact of the unit dose system on nursing time spent preparing and administering medications are presented in Table I. Time savings were reported by 86.6% of respondents with 57% of this group indicating "significant" time savings. The labelling and packaging of unit dose medications were acceptable to 94% of respondents. The unit dose cassette exchange was acceptable to 93% of respondents and the delivery of interim doses was acceptable to 88% of respondents. The effectiveness of the system is supported further by the 82% of respondents who felt unit dose was safer than the previous individual patient prescription (IPP) system. Only 13.5% of respondents felt the unit dose and IPP systems were equally safe, 2% felt the IPP system was safer and 2.5% were unable to compare as they had only

worked with the unit dose system.

Table II provides a breakdown of nursing satisfaction with the unit dose system. A mean rating of 3.9 (maximum = 5) represents nursing satisfaction with the system. Nursing satisfaction was supported further by the fact that 99.3% of respondents would choose to work with a unit dose system. Nursing comments as to why they would choose the unit dose system included "saves time" (26%), "safer" (23.3%), "easier" (11.3%) and "more efficient" (6%).

Analysis of variance was performed to determine whether the perceived time savings and satisfaction levels reported for unit dose differed among nurses based on their employment time in the hospital, their employment status (full or part-time) and whether they had previous unit dose experience. Although no differences were reported between groups for satisfaction levels, a greater time saving was perceived by nurses with one to two years employment than

those with more than five years employment (p=0.02).

One question examined the importance of the unit dose system in nursing employment choices. A high percentage of total respondents (73.4%) indicated they would inquire as to whether the unit dose system was implemented in a hospital when they applied for employment. The remaining 26.6% of total respondents would neither inquire about or be influenced by the presence of the unit dose system. Over two thirds of the respondents (71.8%) who would inquire about unit dose indicated its presence would be a factor in their employment choice. The remaining 28.2% of the respondents who would inquire about unit dose indicated its presence would be the deciding factor in their employment choice if all other factors were equal. These responses indicate that the presence of a unit dose system relates to nursing recruitment.

Analysis of variance was performed to determine whether the

**Table I: Nurses' attitudes on the impact of the unit dose system on nursing time spent preparing and administering medications**

Impact on Preparation and Administration Time	Percentage (Number) of Respondents	
Time Significantly Decreased	49.3%	(74)
Time Somewhat Decreased	37.3%	(56)
No Change	6.0%	(9)
Time Somewhat Increased	6.7%	(10)
Time Significantly Increased	0.7%	(1)
	100%	(150)

**Table II: Nursing satisfaction with the unit dose system**

Satisfaction	Rating	Percentage (Number) of Respondents	
Very	5	24.3%	(37)
	4	44.0%	(67)
Usually	3	30.3%	(46)
	2	0.7%	(1)
Not	1	0.7%	(1)
		100%	(152)

importance of unit dose in nursing employment choices differed among nurses based on their employment time in the hospital, their employment status (full or part-time) and whether they had previous unit dose experience. Nurses with one to two years employment placed greater importance on the presence of a unit dose system when making an employment choice than nurses with five years or more employment ( $p=0.02$ ).

The most frequently reported shortcomings of the unit dose system were the length of time for medication delivery (6.7%), medications not being available if a dose was lost or wasted (4.7%), medications missing from the cassette (4%) and the exact dose required not always provided (4%).

### The Computerized Medication Administration Record

Table III presents nurses' attitudes on time savings in the charting of medications administered with computerized MARs. Time savings were reported by 86% of respondents, with half of this group indicating significant time savings. The effectiveness of the computerized MAR is supported further by 74% of respondents who felt the MAR was safer than the previous manual system using medication tickets. Only 20% of respondents felt the computerized and manual charting systems were equally safe, 2% felt the manual charting system was safer and 4% were unable to compare as they had only worked with the computerized MAR.

Table IV provides a breakdown of nursing satisfaction with the MAR. A mean rating of 3.5 (maximum = 5) represents nursing satisfaction with the MAR. A mean rating of 3.55 was reported for nursing satisfaction with MAR format and 3.25 was reported for

satisfaction with the procedures for updating the MAR. Nursing satisfaction is supported further by the fact that 100% of respondents would choose to work with the computerized MAR.

Analysis of variance was performed to determine whether the perceived time savings and satisfaction levels reported differed among nurses based on their employment time in the hospital, their employment status (full or part-time) and whether they had previous experience with the computerized MAR. Although no differences were reported among groups for the time savings perceived, differences were reported for satisfaction levels with the MAR in general, the format of the MAR and the procedures for updating the MAR. Nurses with less than one year employment were more satis-

fied with the MAR in general ( $p=0.005$ ) and the MAR format ( $p=0.01$ ) than nurses with five years or more employment. Nurses with less than one year employment were more satisfied with the MAR update procedures than nurses with two years or more employment ( $p=0.001$ ).

The most frequently reported shortcoming of the MAR dealt with the procedures for updating it. The change recommended most often was to simplify and streamline the updating procedures. Other problems reported were: MAR discrepancies (14.7%), the lack of space to write on new orders (3.3%), inconsistencies with respect to medication orders appearing on the MAR for surgical patients (2.7%) and the clarity of the print (2%).

Table III: Nurses' attitudes on the impact of the computerized MAR on nursing time spent charting medications administered

Impact on Charting Time	Percentage (Number) of Respondents	
Time Significantly Decreased	43.3%	(65)
Time Somewhat Decreased	42.7%	(64)
No Change	10.7%	(16)
Time Somewhat Increased	1.3%	(2)
Time Significantly Increased	2.0%	(3)
	100%	(150)

Table IV: Nursing satisfaction with the computerized MAR

MAR Category	Satisfaction Rating Percentage (Number) of Respondents				
	Very 5	4	Usually 3	2	Not 1
With MAR in General (N = 152)	17.8% (27)	24.3% (37)	48.7% (74)	7.9% (12)	1.3% (2)
With MAR Format (N = 152)	15.8% (24)	33.6% (51)	41.3% (63)	8.6% (13)	0.7% (1)
With MAR Updating Procedures (N = 148)	10.8% (16)	28.4% (42)	43.9% (65)	9.5% (14)	7.4% (11)

## DISCUSSION

### The Unit Dose System

One of the benefits of the unit dose system is the reduction in nursing time spent in medication preparation and administration. Nurses may be able to use this time for other patient care activities, thereby enhancing the level of patient care. In this study the question addressing time savings with the unit dose system did not ask nurses to quantify the time saved. A subjective classification of the time saving was requested (e.g., "significant time saving"). However, the percentage of respondents reporting at least "some" time saving (86.6%) provides support for the system's ability to reduce nursing time spent in medication-related activities.

The greater time saving perceived by nurses employed more recently at the hospital suggests that nursing support for the unit dose system may be greater among hospitals with a large population of recently employed nurses. Recently employed nurses also place greater importance on the presence of a unit dose system when making an employment choice. This result suggests the presence of a unit dose system may become a more important factor as hospitals replace veteran nursing staff.

Nurses' overwhelming preference to work with the unit dose system (99.3%) plus their high perception of system's safety (82%) provide support for maintaining the program.

The high levels of acceptability for the labelling, packaging and delivery of medications within the unit dose system supports the level of service provided by the Pharmacy Department. Despite the high ratings, the Department continues to be responsive to concerns expressed in these areas.

Although positive responses were provided for most areas of the unit dose system, some shortcomings were identified. The reported increase in medication delivery time in most situations is not related to the medication delivery system. The turnaround time for a "first dose" as either a unit dose packaged medication or an individual patient prescription does not differ according to Pharmacy Department records. The increased delivery time is most likely due to the move of the Pharmacy Department to a new, more remote facility.

The reported problem of medications missing from the patient cassettes has been addressed in two ways. Since implementation of the unit dose system, a check of all medications put into patient cassettes is carried out prior to their delivery to the nursing units. The second measure is an information sheet on all unit dose charts that outlines the causes and prevention of missing doses (e.g., "do not borrow medications from another patient cassette").

The concern that the exact medication dose was not always provided relates to infrequently dispensed doses. If the dose is not prepackaged, the next larger dose or a combination of doses is sent until the exact dose can be prepackaged. This situation arises most often on evenings or weekends when lower pharmacy staffing levels do not always allow immediate prepackaging of the medication.

### The Computerized Medication Administration Record

A benefit of the computerized MAR is the reduction in nursing time involved in the charting of medications administered. As with the unit dose system this time may

be used by nurses for other patient care activities, thereby enhancing the level of patient care. In this study, the question addressing time savings with the MAR involved a subjective classification of time savings similar to the question used with the unit dose system. The high percentage of respondents reporting at least "some" time savings (86%) provides support for the computerized MAR.

The unanimous preference of nurses for working with the computerized MAR plus their high perception of its safety (74%) provide support for maintaining the program.

The higher levels of satisfaction with the computerized MAR by nurses employed more recently at the hospital suggests the benefits may be better recognized by them. Therefore, as with the unit dose system, nursing support for the computerized MAR may be greater among hospitals with a large population of recently employed nurses.

The Pharmacy Department provides MARs once daily in the evenings with nursing staff responsible for updating the MAR between printings (writing on new orders, highlighting discontinued orders). In response to the surveyed nurses' requests to streamline the updating of the MAR, procedural modifications and additional orientation sessions have been provided. Further evaluation is required to assess the success of these changes.

MAR discrepancies include: a medication order not appearing, discontinued orders still present and incorrect order entry by the pharmacist. As for missing doses, the Pharmacy Department has provided an information sheet to nursing units outlining the types of MAR discrepancies and measures

to prevent their occurrence. MAR discrepancies originating in Pharmacy (e.g., incorrect order entry) are reviewed regularly with the pharmacists.

Other identified shortcomings of the MAR dealt with the format, the procedures for interrupting surgical patients' medications and the entry of special types of medication orders. A computer software customization for the MAR was implemented in response to the survey feedback. The enhancements included increasing the amount of space for writing new orders and bold printing of medication administration times on the MAR. The procedures for interrupting surgical patients' medications have been simplified and the procedures for entering special types of orders (i.e., alternate days or in advance of start date) have been clarified to ensure consistency.

In conclusion, the nursing evaluation of the unit dose system and computerized MAR indicate the programs are well accepted by nursing staff and are meeting the overall objectives set prior to implementation. The study results show these programs reduce the perceived amount of nursing time devoted to the preparation, administration and charting of medications. The majority of respondents felt the unit dose system and computerized MAR were safer than the previous distribution and charting systems. In addition, virtually all of the respondents would choose to work with the unit dose system and computerized MAR. The survey results demonstrate strong nursing support which may assist other hospitals in proposing or

justifying these programs.

The feedback received through the survey has directed actions to address the shortcomings of the programs. Although some actions have been undertaken in response to concerns identified, additional work is required to enhance the programs. Quality assurance mechanisms will be used to assess the effectiveness of any changes and to address further concerns. ☒

#### REFERENCES

1. Mann JL, Kribs WJ. Unit dose: it's feasible. *Health Care*. 1984; 2:30-1, 33.
2. Unit dose — IV additive drug distribution, justification, selling, implementation. Ottawa, Ontario: Canadian Society of Hospital Pharmacists, 1990:3-13, 38-9.
3. Budd R. We changed to a unit dose system. *Nursing Outlook*. 1971; 19:116-7.
4. Budd Jacobsen R. Nursing considerations in a unit dose system. *Hosp Pharm*. 1972; 12:420-2.
5. Knoppert DC, Stroup JW, Dinel BA. Medication related nursing activities in a computerized unit dose system. *Can J Hosp Pharm*. 1984; 37:102-4, 107.
6. Schnell BR. A study of unit dose drug distribution in four Canadian hospitals. *Can J Hosp Pharm*. 1976; 3:85-90.
7. Means BJ, Derewicz HJ, Lamy PP. Medication errors in a multidose and a computer-based unit dose drug distribution system. *Am J Hosp Pharm*. 1975; 32:186-91.
8. Lepinski PW, Thielke TS, Collins DM, et al. Cost comparison of unit dose and traditional drug distribution in a long term care facility. *Am J Hosp Pharm*. 1986; 43:2771-9.
9. Canadian hospital pharmacy annual report 1990/91. Scarborough, Ontario: Eli Lilly Canada Inc., 1991:4,19,29.
10. Adams C. Computer-generated medication administration records. *Nursing Management*. 1989; 7:22-3.