—Articles—

Introduction and Evaluation of a Newly Established Holiday Work System in the Ward Pharmacy at Municipal Ikeda Hospital

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At the Municipal Ikeda Hospital, a system in which pharmacists stationed in one ward pharmacy dispense drugs to be administered by injection and injectable preparations delivered to patients' bedsides was introduced in April 2000. This system was aimed at minimizing risks related to injections. Initially, however, on holidays, nurses played the roles of pharmacists in terms of the injections, and there were concerns over a possible rise in the incidence of errors (adverse events/near-misses) related to injections on these days compared with weekdays. Later, when planning to introduce a new holiday work system in the ward pharmacy, we took into account such factors as the number of pharmacists needed on holidays, their duties on holidays and the influence on weekday pharmacy activity of compensatory days-off taken by such pharmacists. In May 2004, the new holiday work system was introduced in the ward pharmacy. Under the new system, 5 pharmacists work at the ward pharmacy on holidays. After this system was put into operation, the number of injections dispensed at the ward pharmacy averaged 230 per day, and 177 per holiday. To evaluate the validity of this system, we recently conducted a questionnaire survey of nurses at our hospital. The survey involved 139 nurses. Of these nurses, 69.1% responded that the number of incidents (adverse events/near-misses) related to dispensing injections on holidays had decreased. Furthermore, 65.4% of the nurses reported a decrease in incidents related to the delivery and administration of injectable preparations. More than half of the nurses answered that the new system had made it easier for them to collect information on medicines and helped them provide better nursing services. When the nurses were asked to make a general assessment of the new system, 90% rated the system as ''good.'' The results of this survey indicate that keeping the ward pharmacy open on holidays contributes to the promotion of the proper use of medicines, reduction of risks related to injections and improvement in the quality of medical care.

Key words——injection; holiday; ward pharmacy; holiday work system; risk

INTRODUCTION

Recently, public interest in medical accidents has increased considerably, and more than 20 cases of errors in the administration of drugs have been reported by mass media each year.[1] According to the report by Kawamura et al. in 1999, those related to injection, instillation, and IVH accounted for 31.4% of all incidents.[2] According to a report on risk management at Kawasaki Medical School, also, errors related to injectable preparations accounted for 20% of all errors.[3] In consideration of the high percentage of incidents related to injectable preparations occurring today, pharmacists must be actively involved in the handling of injectable preparations. Our hospital established a ward pharmacy in April 2000 and started dispensing injectable preparations, including the mixing of instillation preparations for inpatients.[4] Our hospital also devised a system for inspection of the delivery of injectable preparations in October 2001. Under this system, pharmacists directly delivered injectable preparations at patients' bedsides. While delivering the preparations, pharmacists provide information related to the drugs delivered, monitor adverse reactions, etc.[5] The execution of these operations has reduced the risk concerning injectable preparations.[5—7] However, the work associated with injectable preparations was still implemented by nurses on Saturdays, Sundays, and holidays, and we were apprehensive that more incidents might occur on holidays than on weekdays. We thought it would also be advisable for pharmacists to provide their services related to injections on holidays.

We therefore held discussions within the Department of Pharmacy to reach a consensus concerning holiday services of the ward pharmacy and then made

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a proposal to the hospital management to open the ward pharmacy on holidays. Later, we made arrangements with other hospital sections (involving physicians, nurses and other workers). In May 2004, the ward pharmacy began providing services related to injections for inpatients on holidays. This paper reports management of the holiday work system and the results of a questionnaire survey of nurse performance to assess this system.

MATERIALS AND METHODS

Management of the New Holiday Work System

Contents of Work and Pharmacists on Duty at the Ward Pharmacy In our hospital, which has 364 beds (increased to 100 beds in July 2004), there are 22 pharmacists, consisting of 12 at the ward pharmacy, 4 at the dispensing room, 2 at the outpatient mixing room, and 4 at the management section (including the Pharmacy Director), who supervise drug information (DI), pharmaceutical affairs, and drug management operations. The pharmacists at the ward pharmacy perform work related to injectable preparations and to pharmaceutical care for patients.

On holidays, the ward pharmacy is staffed by 5 pharmacists based on the fact that 3 dispensers and 2 checkers are needed during the hours in which the largest number of preparations must be dispensed on weekdays (10 : 00—12 : 30). Fifteen pharmacists, consisting of 12 at the ward pharmacy and 3 at other sections (excluding the section chiefs and new members), were incorporated in the holiday shifts. Under this system, each pharmacist works on two holidays during each three-week period. For each day of work on the holiday, the pharmacist is allowed one compensatory off-duty weekday.

The ward pharmacy staff worked on 2 shifts, from 8 : 15—16 : 45 and 9 : 00—17 : 30, on weekdays, but on 1 shift, from 8 : 15—17 : 30, on holidays.

Management of Work at the Ward Pharmacy Work related to injectable preparations and work related to pharmaceutical care for patients were performed on holidays as on weekdays. Figure 1 shows the work schedule on holidays. Injection mixtures were prepared 4 times in a day as well as on weekdays (Table 1). However, the preparations dispensed for the administration starting at 10 : 00 am were limited to those for continuous instillation, in consideration of the holiday shifts of nurses. Drip infusion for inpatients often starts at 10 : 00 am. We therefore foresaw the possibility that the delivery of injectable preparations needed for 7 wards might not be finished by 10 : 00 am if this work was assigned to only 5 pharmacists. Therefore, while the drugs were delivered to the bedsides on weekdays, they were delivered only to the nurse stations of the wards on holidays (Table 1).

Number of Injectable Preparations Dispensed The influence of the new ward pharmacy operating system on injection dispensing services was evaluated by analyzing the monthly number of injectable preparations for drip infusion dispensed at the ward pharmacy during a one-year period from January to December 2004. Furthermore, the daily number of injectable preparations for drip infusion dispensed at the ward pharmacy was analyzed in relation to the time of day when drip infusion was started for the six-

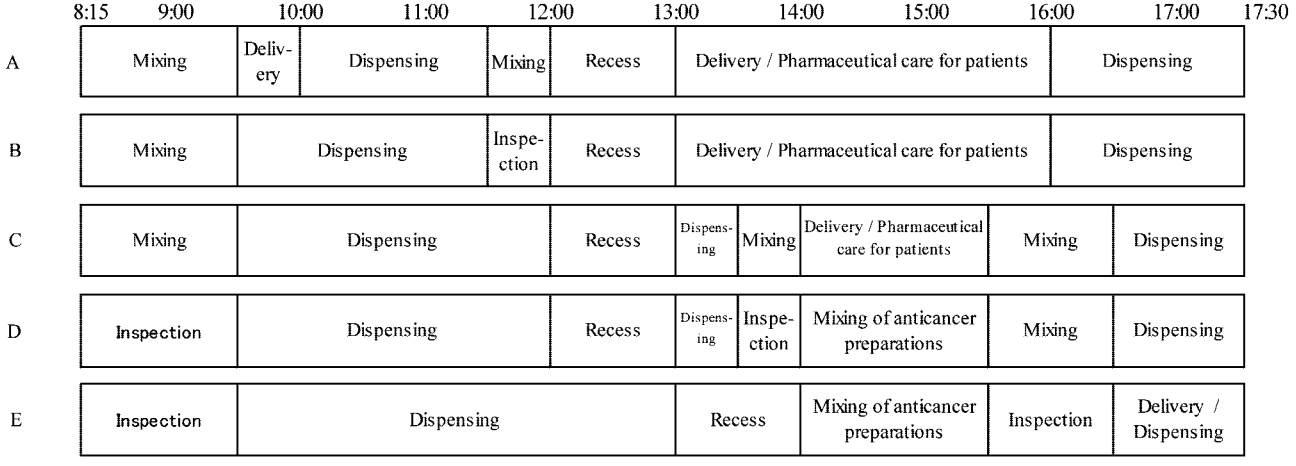

Fig. 1. Examples of the Work Content of the 5 Pharmacists on Duty at the Ward Pharmacy on a Holiday

Table 1. Comparison of Work Related to Injectable Preparations at the Ward Pharmacy between Weekdays and Holidays

Time of the beginning of instillation	Weekdays		Holidays	
	Dispensing	Delivery of drugs	Dispensing	Delivery of drugs
10 : 00—12 : 30	All instillation preparations	To the patients' bedside	Instillation preparations*	To the ward nurse stations
12 : 30—15 : 00	All instillation preparations	To the patients' bedside	All instillation preparations	To the patients' bedside
15 : 00—17 : 30	All instillation preparations	To the patients' bedside	All instillation preparations	To the patients' bedside
17 : 30—22 : 00	All instillation preparations	To the ward nurse stations	All instillation preparations	To the ward nurse stations

* Except preparations for continuous instillation started at 10 : 00.

month period from July to December 2004, and this number was compared between holidays and weekdays.

Number of Patients Receiving Pharmaceutical Care The influence of the new system on pharmacists' care of patients (advice and management of drug therapy for individual patients) was evaluated by comparing the number of patients receiving this care at three time points, i.e., April 2004 (before the introduction of the system), June 2004 (after its introduction) and October 2004 (after the number of beds increased to 100).

Method of Questionnaire Survey for Nurses For the assessment of the new system, nurses completed a questionnaire before and after the introduction of the system with regard to the number of incidents concerning injectable preparations, the state of drug information service for patients, the content of nurses' work on holidays, and a general evaluation of the system. Table 2 shows the contents of the questionnaire. The answer-selection type questionnaire was performed between December 16 and 28, 2004. The questionnaire was completed by all nurses working in the wards, but the data of those who were employed after the change of the work system (May 2004) were excluded because of the comparative nature of the survey.

RESULTS

Number of Injectable Preparations Dispensed Figure 2 shows the monthly number of injectable preparations dispensed at the pharmacy. The number increased in May 2004 because of the introduction of the new system, and in July because of an increase of 100 beds. During the 6 months from July to December, the mean number of dispensed injectable preparations was 230/day on weekdays and 177/day on holidays.

Figure 3 shows the number of injectable preparations dispensed per day according to the time of the beginning of administration. In the 10 : 00—12 : 30 shift, the number of preparations dispensed on holidays was 55% of that on weekdays because of the restriction of dispensing on holidays. In the other periods, however, no marked difference was observed between weekdays and holidays.

Number of Patients Receiving Pharmaceutical Care Table 3 shows the number of patients to whom pharmacists provided pharmaceutical care before and after the introduction of the new ward pharmacy system. Eleven pharmacists were involved in pharmaceutical care for patients both before and after system introduction. Before the introduction of the system, 637 patients received care. Immediately after the system was introduced, the number decreased to 565. Later, following the increase of beds to 100, the number of patients receiving pharmaceutical care increased to 826.

Results of the Questionnaire in Nurses In total, 163 nurses responded to the questionnaire (response rate 90.1%). Figure 4 shows the duration of service as a nurse and duration of service at our hospital. In July 2004, the number of beds at our hospital was increased from 264 beds to 364. To cope with this bed increase, the number of nurses was also increased. For this reason, 22.1% of the nurses had a career of less than 1 year as a nurse, and 43.5% of the nurses had worked for less than 1 year at our hospital. Twenty-four nurses (14.7%) were employed after May 2004, and the answers of 139 nurses were analyzed,

Table 2. Questionnaire about the Holiday Work System in the Ward Pharmacy

Duration of service as a nurse		
Less than 1 year	1 year or longer	3 years or longer
5 years or longer	10 years or longer	20 years or longer
Duration of service at Municipal Ikeda Hospital		
Less than 6 months	6 months or longer	1 year or longer
3 years or longer	5 years or longer	10 years or longer
20 years or longer		
Question 1: Has the number of incidents related to the dispensing of injectable preparations decreased on holidays?		
1. Markedly decreased	2. Decreased	3. Same as before
4. Increased	5. Not sure	
Question 2: Has the number of incidents related to the delivery and administration of injectable preparations decreased on holidays?		
1. Markedly decreased	2. Decreased	3. Same as before
4. Increased	5. Not sure	
Question 3: Has the number of incidents concerning injectable preparations other than those mentioned in Questions 1 and 2 decreased on holidays?		
1. Markedly decreased	2. Decreased	3. Same as before
4. Increased	5. Not sure	
Question 4: Has the number of incidents concerning matters other than injectable preparations decreased on holidays?		
1. Markedly decreased	2. Decreased	3. Same as before
4. Increased	5. Not sure	
Question 5: Has it become easier to obtain information about drugs on holidays?		
1. Markedly improved	2. Improved	3. Same as before
4. Not sure		
Question 6: Has the work related to injectable preparations performed by nurses decreased?		
1. Markedly decreased	2. Decreased	3. Same as before
4. Increased	5. Not sure	
Question 7: This question is intended for those who answered ''1'' or ''2'' in Question 6. Has the quality of other nursing work improved as the work related to injectable preparations decreased?		
1. Markedly improved	2. Improved	3. Same as before
4. Deteriorated	5. Not sure	
Question 8: What is your overall evaluation of the holiday work system in the ward pharmacy?		
1. Very good	2. Good	3. Same as before
4. Bad	5. Not sure	

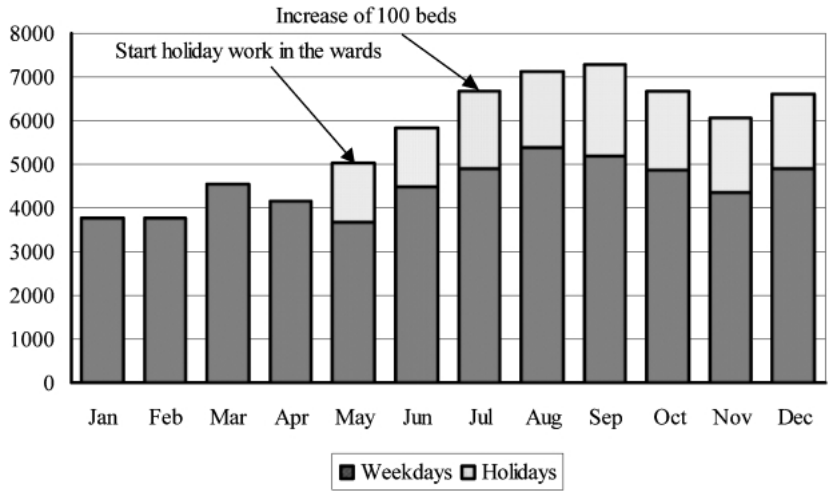

Fig. 2. Monthly Number of Dispensed Injectable Preparations (January-December, 2004)

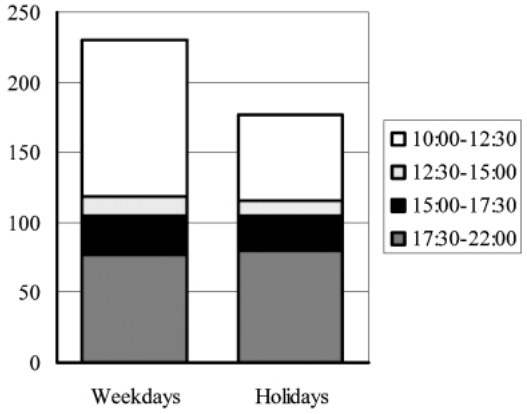

Fig. 3. Mean Daily Number of Dispensed Injectable Preparations According to the Time of the Beginning of Administration (July-December, 2004)

Table 3. Number of Patients Receiving Pharmaceutical Care: before (04/2005) and after (06/2005, 10/2005) Introduction of New Holiday Work System*

	Number		Monthly number of pharmaceutical care		
	Beds	Assigned pharmacists	Inpatients as object	Cares	Cares at discharge
before 04/2005	264	11	433	637	159
after 06/2005	264	11	400	565	147
10/2005	364**	11	600	826	236

* New holiday work system introduced in May 2005. ** Number of beds for inpatients increased to 364 beds in July 2005.

excluding those of these newly employed nurses.

Figure 5 shows the results of the questionnaire survey of nurses pertaining to the number of incidents they had experienced on holidays after the introduction of the new system. Of all the nurses, 69.1% responded that the number of incidents related to dispensing injections had decreased; 65.4% reported a decrease in the incidents related to delivery and administration of injectable preparations to patients; 54.1% reported a decrease in incidents related to injectable preparations other than dispensing, delivery, or administration. The number of incidents related to issues other than injections had also decreased, according to 43.7%.

When asked about drug information provided from the pharmacy on holidays, 51.0% of the nurses answered that information was easier to obtain after the introduction of the new system. When asked about changes in the job of nursing, 83.4% of the nurses answered that their workload was reduced under the new system. Of the nurses who answered that their work was reduced, 65.5% answered that it led to improvements in the performance of other nursing work.

Figure 6 shows the results of the questionnaire concerning the overall evaluation of the new system. The new system was rated as ''very good'' by 32.4% and ''good'' by 57.6% of the nurses, being positively evaluated by 90% of all nurses.

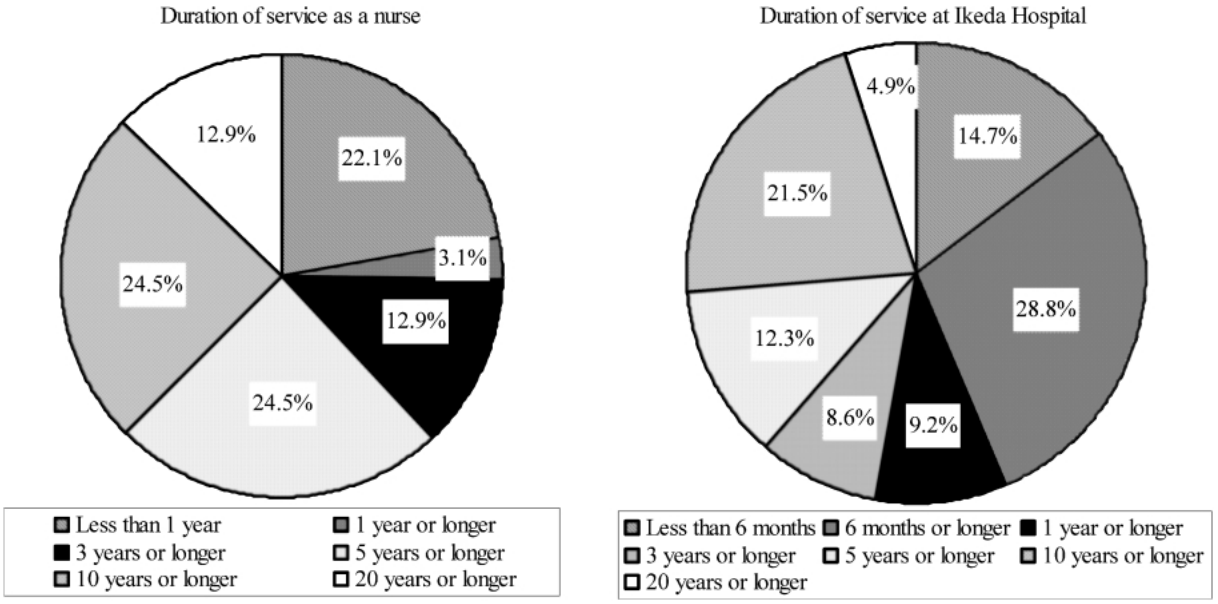

Fig. 4. Duration of Service as a Nurse and Duration of Service at Municipal Ikeda Hospital of the Respondents

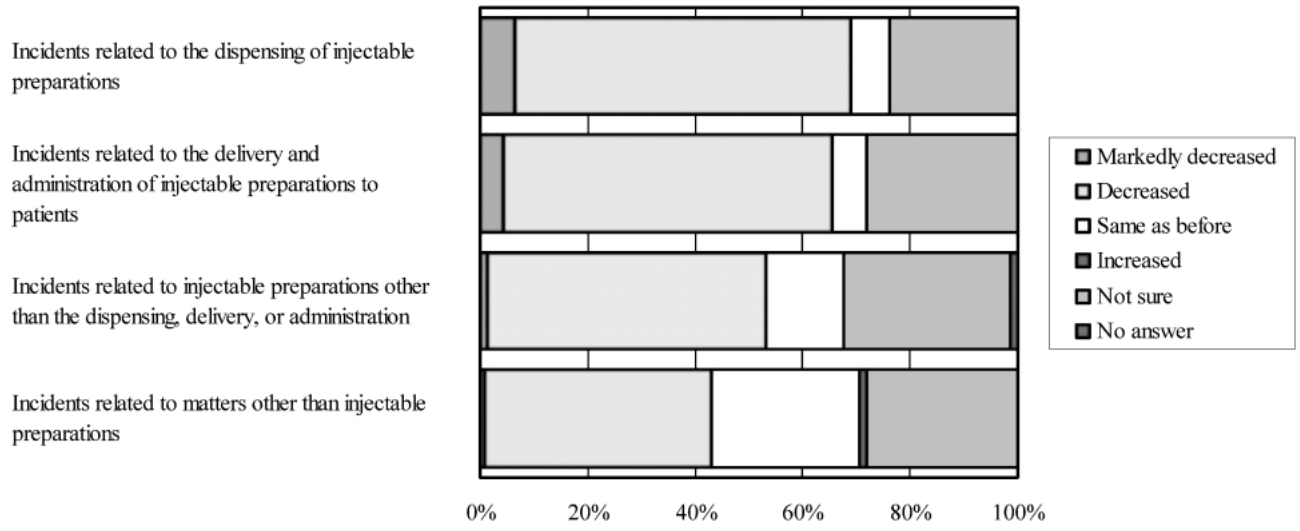

Fig. 5. Results of the Questionnaire concerning the Number of Incidents Experienced by Nurses

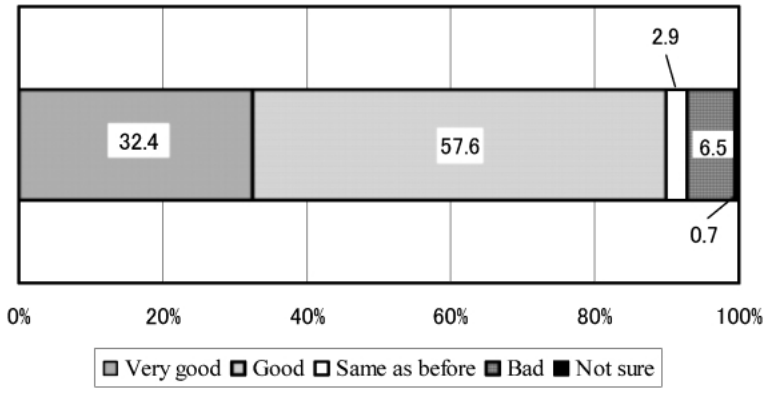

Fig. 6. Results of the Questionnaire concerning Overall Evaluation of the Holiday Work System in the Ward Pharmacy

DISCUSSION

At our hospital, work related to injectable preparations has been performed with regard to instillation preparations on weekdays from the year 2000 to prevent the risk of misuse of injectable medicine. Under the previous system, nurses assumed the duties related to injections. We previously conducted studies on errors related to injections.[5—7] Those studies suggested the possibility that incidents would be more likely to occur on holidays than on weekdays. We therefore thought it was advisable to introduce a system whereby pharmacists worked on holidays as soon as possible. We had been concerned about the possible effects of not participating on holidays in work related to injections. All pharmacists agreed to a plan that would require irregular work schedules involving occasional work on holidays. We discussed various problems expected to arise following the introduction of the new system.

The number of pharmacists on duty at the ward pharmacy on holidays have to be determined taking into consideration the amount of work on holidays and the effects of the compensatory leaves of pharmacists on weekday operations. The work on holidays was estimated from the weekday work at the ward pharmacy, and the number of pharmacists on duty was determined to be 5 considering the amount of work and the holiday shifts of nurses. The number of preparations dispensed at the ward pharmacy on holidays did not markedly differ from that on weekdays except that some operations were inevitably omitted in a particular period on holidays (Fig. 3).

To assign 5 pharmacists to ward pharmacy duties on holidays, 2 pharmacists take a day off on each weekday. We were apprehensive of the effects of the

loss of the work of 2 pharmacists on weekdays, particularly the work related to pharmaceutical care for patients.

Then, we considered how to improve the efficiency of the work done at the ward pharmacy. Under the previous system, the duty of injection dispensing, which often had to be done on weekday mornings, was taken on by all pharmacists in the ward pharmacy. As a result, it was almost impossible to provide pharmaceutical care for patients in the morning. The new system was designed to resolve these problems. First, the new system divides the pharmacists working on weekdays into two groups: (1) the group working between 8 : 15 and 16 : 45 (5 pharmacists/day) and (2) the group working between 9 : 00 and 17 : 30 (the other pharmacists stationed at the ward pharmacy). In the morning, the first group dispenses injections and the second group provides pharmaceutical care for patients. On holidays, the work of pharmacists is not confined to dispensing injections; adequate time is spent on providing pharmaceutical care for patients (Fig. 1). That is, while delivering injectable preparations on holidays, pharmacists also provide pharmaceutical care for patients, as they do on weekdays. Through the measures taken to improve working efficiency at the ward pharmacy, the number of patients receiving pharmaceutical care from ward pharmacists increased after introduction of the new system, despite the increase in the volume of work related to dispensing injections due to a bed increase of 100, and despite the fact that there was no increase in the total number of pharmacists working at the ward pharmacy (Table 3).

In the questionnaire survey, the nurses considered that the new system reduced not only the risk of work related to injectable preparations, but also the risk concerning matters other than injectable preparations on holidays. The system also allowed the pharmacists to provide drug information and monitoring to the patients' bedsides, to answer the patient's questions about prescriptions, and to provide drug information for the medical staff on holidays. The nurses also appreciated these services positively in this survey. However, nearly 50% of the nurses answered ''same as before'' or ''not sure'' about the information service. This suggests an insufficiency of understanding of the role of pharmacists in team care at the ward, by ward nurses, and the necessity for approaches to this problem for the future. The fact that pharmacists performed work related to injectable preparations on holidays as well as weekdays also markedly affected the content of nurses' work. Nurses were also on holiday shifts, and fewer nurses were on duty on holidays than on weekdays. In this situation, the decrease in work related to injectable preparations led to an increase in the time for care of patients, possibly resulting in an improvement in the overall quality of medical care.

The implementation of the new system promoted the appropriate use of drugs by prescription monitoring and reduced the risk of errors in the dispensing and administration of drugs on holidays. In the conventional system, in which only 1 pharmacist was on duty at the ward pharmacy on holidays, the pharmacist was often busy with the management of emergency outpatients, making it difficult to promptly respond to inquiries from the ward nurse stations. However, the change in the system made it possible for pharmacists to immediately go to the ward nurse station or the patient's bedside, or provide information by telephone. In the past, in the absence of pharmacists, questions about medicines on holidays had to be resolved by nurses alone. After the introduction of the new system, pharmacists are available to receive consultations about such questions, thus reducing the risks on the ward related to medicines. Under the new system, nurses spend less time on work related to injections, thus reducing the risk involved in such work. The time saved by nurses can be used for patient care and other nursing services, thus elevating the quality of medical care in general.

As out-of-hospital drug dispensing for outpatients has become prevalent, hospital pharmacies have been required to reform their systems to more efficiently perform operations centering around inpatient care. The new holiday work system presented in this report is a step towards the development of such inpatient-centered pharmacy services. We consider that this step must be followed by an evaluation of the introduction of a three-shift work system[8] in order to provide better pharmacy services to inpatients, whose condition may change at any time.

REFERENCES

1) Furukawa H., *J. Jpn. Soc. Hosp. Pharm.*, **40**, 1101–1105 (2004).
2) Kawamura H., ''Research on the Construction of Medical Risk Management Systems,'' 2000,

pp. 13–31.
3) Hara K., *Farumashia*, **38**, 518–522 (2002).
4) Kawaguchi S., Myotoku M., Shimomura K., Inui T., Suyama T., Haji H., *Jpn. J. Pharm. Health Care Sci.*, **27**, 565–570 (2001).
5) Myotoku M., Tomida Y., Murayama Y., Igarashi E., Nakanishi A., Fukao T., Fujiwara N., Shimomura K., Kawaguchi S., Haji H., *Jpn. J. Pharm. Health Care Sci.*, **29**, 421–426 (2003).
6) Myotoku M., Shimomura K., Fukao T., Inui T., Suyama T., Kawaguchi S., Haji H., *Jpn. J. Pharm. Health Care Sci.*, **28**, 315–320 (2002).
7) Myotoku M., Shimomura K., Kawaguchi S., Haji H., *Jpn. J. Pharm. Health Care Sci.*, **31**, 58–94 (2005).
8) Kotsubo K., Yoshikawa M., Takada A., Sendo T., Itoh Y., Oishi R., *J. Jpn. Soc. Hosp. Pharm.*, **40**, 991–994 (2004).