

## Standardization of Job Analysis and Cost Analysis in Departments of Radiotherapy and Surgery by Employing Computerized Database

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### INTRODUCTION

To construct and operate a database for the purpose of analyzing jobs of medical staffs in radiotherapy department and surgery department, we have developed and are operating a database. The aim of analysis is to optimize workflows and staffs deployment and to measure actual time spent for a patient for the standardization of cost analysis methodology.

### METHOD

Raw data entered to the database were records of job of medical staffs in term of:

- (1) name of jobs according to the terminology defined by the authors,
- (2) elapsed time length of jobs done,
- (3) places where jobs done,
- (4) identification of medical staffs such as medical doctors, nurses, technologists and etc.,
- (5) identification of patients treated or cared.

Fig.1 shows method of time studies of 24 hours a day, that were carried out in July and August of 1998 for a week at the Second Surgery Department and two weeks at the Radiotherapy Department in Osaka University Hospital. Medical doctors, nurses, assistants to nurse and patients were followed up by 173 working days of part timers who were students in the School of Allied Health Sciences, Osaka University.

The database was constructed by Access (Microsoft made) according to job nomenclature and its hierarchy which were revised after the data collection. Five dimensional architecture of database was constructed in terms of time/date, spent time, place, name of jobs and identification of medical staffs and patients.

Fig.2 shows entry screen. Raw data entered to the database are records of job by medical staffs on this entry screen. First, identification of medical staffs such as medical doctors, nurses, technologists and etc. is done. Second, places where jobs done are specified. Third, name of jobs according to the terminology defined by the authors is entered. Fourth, elapsed time length of a job done is input. Fifth, identification of patients treated or cared

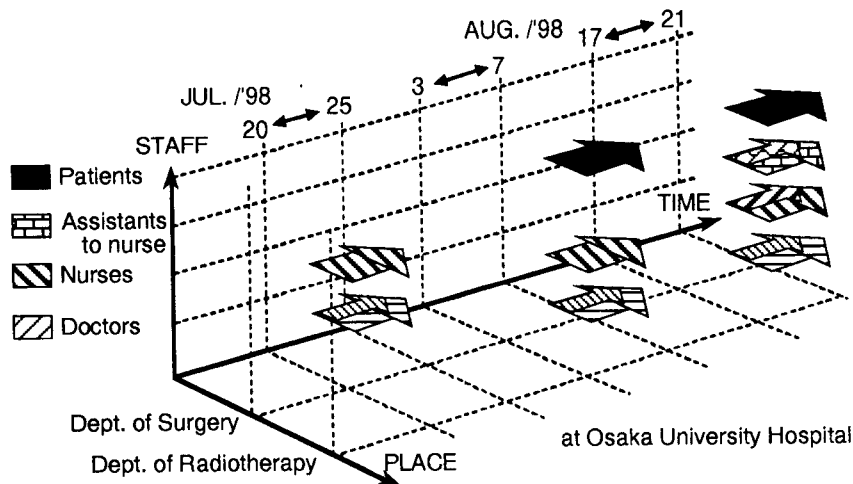


Fig.1 Time-studies of 24 hours a day

Fig.2 Entry screen

is entered. Finally, preservation of raw data is done.

Table 1 shows job classification. Job classification is composed of three categories: the 1st, the 2nd, and the 3rd. Those three categories are made of one hierarchy. For examples, the 1st category is mission such as medical practice. The 2nd category is work such as medical examination. The 3rd category is job or task such as medical examination or preparation or others. Table 2 shows number of data collected. One record means 1 number of job.

## RESULT

Various kinds of statistics were worked out from the database such as:

- 1) Contents analysis and comparison of jobs done by individual medical doctor, nurse and other medical professions,
- 2) Care map of patients treated or cared and sorted out by disease names,
- 3) Time dependent change of jobs done by medical doctors, nurses and other medical professions for 24 hours a day,
- 4) Time dependent nursing density for 24 hours a day,
- 5) Occurrence frequency and the cause of troubles in job unexpected or interrupted.

As an example, concentration distribution of practice time between the

Table 1 Job classification

<i>The 1st</i>	<i>The 2nd</i>	<i>The 3rd</i>		
<i>Medical practice</i>	<i>A med. exam.</i>	<i>A med. exam.</i>	<i>Preparation</i>	<i>Others</i>
	<i>Treatment</i>	<i>Treatment</i>	<i>Preparation</i>	<i>Others</i>
	<i>Prescription</i>	<i>Prescription</i>	<i>Preparation</i>	<i>Others</i>
	<i>Medication</i>	<i>Medication</i>	<i>Preparation</i>	<i>Others</i>
	<i>Mental care</i>	<i>Mental care</i>	<i>Preparation</i>	<i>Others</i>
	<i>Explanation</i>	<i>Explanation</i>	<i>Preparation</i>	<i>Others</i>
	<i>Collecting info.</i>	<i>Collecting info.</i>	<i>Preparation</i>	<i>Others</i>
	<i>Info. exchange</i>	<i>Info. exchange</i>	<i>Preparation</i>	<i>Others</i>
	<i>Operation</i>	<i>Operation</i>	<i>Preparation</i>	<i>Others</i>
	<i>Decision making</i>	<i>Decision making</i>	<i>Preparation</i>	<i>Others</i>
	<i>Others</i>	<i>Others</i>	<i>Preparation</i>	<i>Others</i>
	<i>Undefinable</i>	<i>Undefinable</i>	<i>Preparation</i>	<i>Others</i>
<i>Quasi-medical practice</i>	<i>Blood gathering</i>	<i>Blood gathering</i>	<i>Preparation</i>	<i>Others</i>
	<i>Urine gathering</i>	<i>Urine gathering</i>	<i>Preparation</i>	<i>Others</i>
	<i>An Intravenous drip</i>	<i>An Intravenous drip</i>	<i>Preparation</i>	<i>Others</i>

Table 2 Number of staffs and number of records collected.

Staff	Total	Dept. of Surgery		Dept. of Radiotherapy	
		persons	records	persons	records
Doctor		48	5,351	18	2,373
Nurse		36	11,600	26	7,926
Assistant to nurse		—	—	8	1,426
Patient		—	—	60	5,634

(1 records = 1 number of job)

radiotherapy department and the surgery department was compared every days during time from 7:00 in the morning to 23:00 at night. In the radiotherapy department the time spent for medical practice was almost as same that of miscellaneous practice. But in the surgery department the time spent for medical practice was three times more than that of miscellaneous practice.

Fig.3 shows that rate of jobs peculiar to radiotherapy department to all doctor's jobs is less than 10%, but the rate of treatment itself is more than 50%. ( The second left bar in Fig.3 )

Fig.4 shows that in the radiotherapy department 90% of inpatients time in a day is daily living time. Medical staffs take care of patient for only 10% of inpatient time in a day.

Table 3 shows a standardized equation of cost calculation of personnel costs. Total cost is the sum of the product of both loading of medical staff in an hour and hours spent for a patient by the medical staff.

Sensitivity analysis expecting time shortening of 50 % reduction for each item of targetted jobs were carried out, and possibility of further time reduction from 9 hours 14 minutes to 6 hours 39 minutes was figured out.

## DISCUSSION AND CONCLUSION

The result of statistics tells quantitative difference

- (1) between the radiotherapy department and the surgery department,
- (2) between individuals of medical staffs,
- (3) between occupations of medical staff
- (4) between names of disease and situation of patients.

The strategy for organizing staffs, deploying staffs and designing floor layout, job rationalization in two departments were discussed and simulated. Also cost analysis figured out the result in which much more effort had to be focused on to minimize redundant jobs and idling time spent for the communication or information transfer by conventional means. Much more collection of raw data and abundant accumulation to the database will be carried out in next year, and improved accuracy of statistics is expected to be improved also in other departments as well as in radiotherapy department and surgery department.

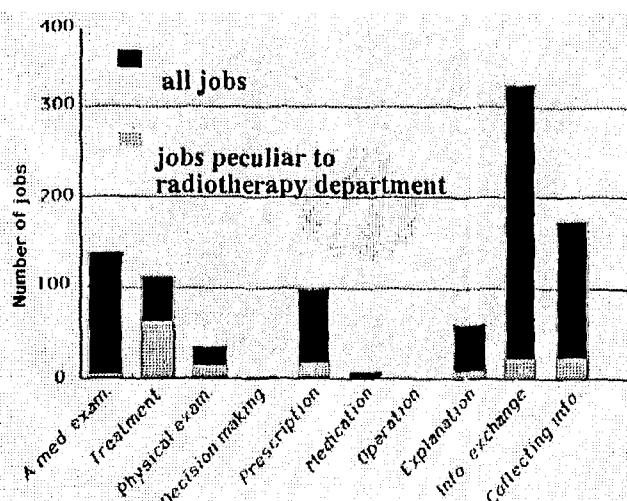


Fig.3 Number of jobs peculiar to radiotherapy department in all jobs

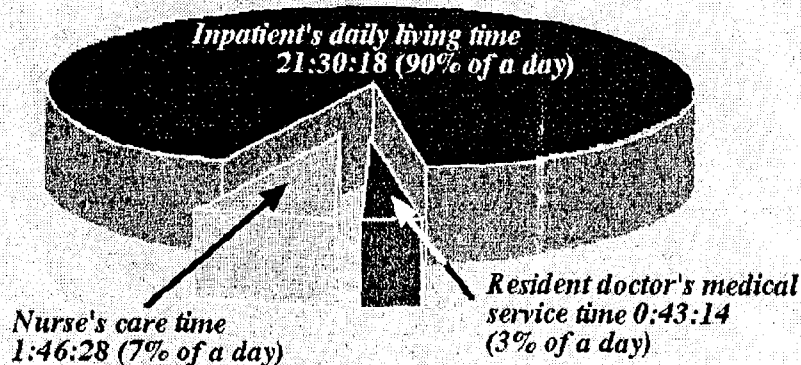


Fig.4 The components of inpatient time in a day in the Radiotherapy department

Table 3 Standardized calculation method ( personnel expenses )

$$\text{Total cost} = \sum_{i=1}^n \frac{\text{(Medical staff's salary)}}{\text{(Business hours of a month)}} \cdot \text{(Hours spent for a patient by the medical staff)}$$

$n$ ; The number of medical staffs who took care of a patient.