

A Method for Examining Personnel in Dental Care Delivery

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Application in 14 practices

THE APPROPRIATENESS OF TASK ALLOCATION for dental auxiliaries is of increasing concern to the dental profession. In 1960, the American Dental Association's House of Delegates (1) passed a resolution requesting experimentation and research to determine the roles of the dental hygienist and the dental assistant as members of the dental team. Since that time, the subject of task allocation has been actively researched. Studies have been conducted primarily in government and university settings. Task transfer from dentists to other dental personnel and the incorporation of the expanded-duty auxiliary have been studied regarding the effects upon the delivery of services (2-9). More recently, research has been extended from government and university settings to private dental practices (10, 11). The methods of observation include the use of closed-circuit television cameras, video tapes, and time-lapsed movies. Although this research has made significant inroads into the subject and is, in part, responsible for revisions of State dental practice acts, it is generally agreed that further research is necessary to determine task allocation's practicality and potential for existing dental practices (12).

The need to develop a systematic and feasible approach to study task allocation more widely has been intensified by changes and developments reflected in several significant trends. First, many State dental practice acts have been revised and others are being revised so that auxiliaries' functions may be expanded. Second, the demand for dental care has increased as education and income levels rise (13, 14), as the population grows, and as the trend toward third party financing of dental care becomes more prevalent (15). Third, the conservation of the natural dentition will require a shift in the time designated for patient educa-

tion and preventive service (16). Finally, because dental practice organization and management have become increasingly more complex, the roles of the members of the dental team are being reassessed.

A method for examining the use of dental auxiliaries within the context of these trends was developed by a research project at UCLA, "Task Analysis in Dentistry: Computer Applications." An integral part of the project is a task-oriented, information-gathering system. Using the system, the levels of provider-task-patient interaction that are presently occurring in a wide range of dental practice settings in several States can be examined and measured for relatively little cost. (The approximate cost of studying one dental practice is \$500.) This sum includes travel, onsite instruction of staff, forms, and computer time. We describe the methodology and present some findings obtained from the system's application to 14 practices.

Methodology

Data collection. The "task analysis" self-generated method of data collection consists of forms designed for both the ease of the user and thoroughness in obtaining an in-depth examination of dental personnel utilization. The participating dental practice is defined as an organizational and physical entity, and the practice's population is profiled according to certain demographic characteristics. The principal focus is on the tasks performed by the different types of personnel in actually giving patient care and the time expended performing these tasks. A feedback report gives the practitioners insight into their unique use of personnel and their practice patterns. This report is the incentive that establishes a commonality of interest between the researcher and the practitioner to generate valuable data.

During an interview with the primary decision maker of the practice (the dentist or business manager) a research assistant obtains the following information about the practice: (a) geographic location, (b) organizational type, (c) category of practice, (d) facilities and equipment, and (e) staffing patterns. The variables of the practice recorded on this first level of collection can be compared with the variables of other practices.

The second level of data collection is the dental patient contact record (PCR), a patient-visit form. During the 4-week study period, this form is completed by the receptionist for each patient visit before treatment and by those providing the care during the treatment. On the average, it takes 2 minutes of total per-

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sonnel time to complete this form.

The PCR has three sections on one side and a list of tasks on the other. Demographic characteristics of patients served by the practice are obtained in the first section. The second section describes the relationship between the patients and the practice by type of visit, reason for the visit, source of payment, and disposition. The core of actual patient care is contained in the third section. This information represents direct provider-patient interaction and generally includes only chairside activity. The information does not include administrative, housekeeping, and laboratory tasks that do not take place during the actual patient visit. The provider of care or combination of providers, the tasks performed, the time spent in the performance of the tasks, and the charges are defined in this section.

A task is defined as that part or step of a dental procedure that is (a) of sufficient duration to warrant recording, that is, a minute or more and (b) performed by an individual provider or by a combination of providers. An amalgam restoration, for example, would consist of two basic tasks. First, a preparation phase and then a restoration phase. "Units" and "surfaces" indicate the frequency of task performance during the patient visit, and "materials" completes the description of the task. A single provider or a combination of providers are identified for each task performed in the practice. "Skill code" identifies the type of provider or combination of providers performing the tasks.

The following basic skill codes indicate the usual personnel combinations used in the practices studied. For the study period each provider type is identified by a particular code number.

Dentist

Dentist and dental hygienist
Dentist and dental assistant
Dentist and 2 dental assistants

Dental hygienist

Dental hygienist and dentist
Dental hygienist and dental assistant

Dental assistant

Dental assistant and dentist
Dental assistant and dental hygienist
Dental assistant and dental assistant

Others

Anesthetist
X-ray technician
Laboratory technician
Instructor
Dental student
Preventive therapist
Health aide
Receptionist

Naturally, the more complex the organization, the greater the possibility of more varied personnel interactions. Other skill codes are used as required by the practice. A skill code pattern is established for each task, for example, percentage of "fill and carve" performed by the dentist alone, by the dentist and dental assistant, and so on. "Time" is a crucial factor for

measuring the time expended by the personnel in task performance and for understanding the implications of task allocation in the practice.

The study period begins after the staff has been properly instructed in the use of the PCR. Digital clocks are installed in the operatories to facilitate the recording of time. The completed PCRs are sent to UCLA for review and processing weekly.

Feedback report. The feedback report is the main incentive for dental practices to participate in this study. It is based on data collected on the PCRs at each site and consists of five major sections: (a) calendar, (b) demographic variables, (c) breakdown by task category, (d) 20 most frequent tasks, and (e) breakdown by skill code. Each section provides a perspective on the facets of dental services occurring within the practice.

The calendar frames the experience of the study by the number of patients seen daily. The number of tasks performed and charges for service are usually included in this section. This can be used for comparison with other sources available to the practitioner—appointment book, billing system, and so on. It also provides a reference point for the following sections.

The demographic section provides a view of the patient population related to age and racial and sexual distribution, as well as appointment behavior. The last three sections provide data that are unique, because personnel utilization is examined from different viewpoints.

The breakdown by task-category section offers the practitioner an overview of the task involvement of the practice personnel by the 10 categories of tasks listed on the reverse side of the PCR. The various personnel combinations within the practice are examined by task category. For example, the practitioner is able to assess the use of dental assistants in preventive tasks in terms of the practice's actual needs. A disproportion may exist between the use of personnel and the various service categories of the practice.

In the fourth section, the 20 most frequent tasks, the focus shifts from category of task to specific tasks. Each task is presented from two viewpoints. First, the task is summarized by its frequency or number of times it occurred in the practice during the study period; the total time (recorded in minutes) devoted to the task; the percentage of all task time spent on the specific task; and the range of time for the performance, from the fastest to the slowest. Then, the task performance is summarized by specific provider combinations. The delegation of the particular task is outlined. For example, one task—place rubber dam, multiple teeth—was performed in one practice by the dentist alone only 6 times (9 percent), by the dentist and the dental assistant 23 times (45 percent), and by the dental assistant interacting with the patient 37 times (54 percent). This represents the skill code pattern for this task in

this practice. Thus, the task-provider view enables the practitioner to make decisions regarding the degree of delegation appropriate for this task and to determine the degree of task allocation feasible for each member of his dental team.

Breakdown by skill code is perhaps the most significant section of the feedback report. The roles of the practice personnel are viewed through the total patient care task involvement of each, working as a solo provider and in combination with others. As a solo provider interacting with the patient, the dentist's most time-consuming task is providing patient consultation, and the next most time consuming is the adjustment of dentures. As a solo provider interacting with the patient, the dental assistant spends the most task time using visual aids for patient education and the next most time in instruction on toothbrushing. The current job description of the various personnel in the practice is depicted in this section.

Validity of Data

To demonstrate the feasibility of collecting task-level data from motivated dental personnel and the validity of the data collected, the following test was conducted. During 2 full working days of patient visits, trained observers were stationed in the operatories of three practice sites. The observers recorded on PCRs all information concerning the patient care tasks that they saw being performed. The practice personnel also recorded all relevant information on PCRs about the same tasks. The two methods of data collection, observer and self-recorded, were then compared with specific attention to the identification of tasks and the recording of task times on 112 PCRs.

There was 92 percent agreement in the identification of tasks by the observers and the practice personnel. Of the 541 tasks recorded, only 45 were omitted by either observers or practice personnel. Most differences between the two groups were in connection with the task of performing intraoral examination. The observer could not distinguish whether or not an actual examination was taking place. When this task was eliminated, agreement reached 95 percent.

A crucial aspect of the validity of data generated by this method depends on the ability of the providers to record task times. The recording of time by observers and practice personnel was compared by computation of the correlation coefficient for each of the three sites. The correlation coefficients ranged from 0.88 to 0.93, which indicates a high degree of agreement. This result demonstrates that the method of collecting self-generated data can be accurate in practices having properly trained and motivated personnel.

Findings

Scope of application. From May to August 1973, the "task analysis" methodology described was applied to

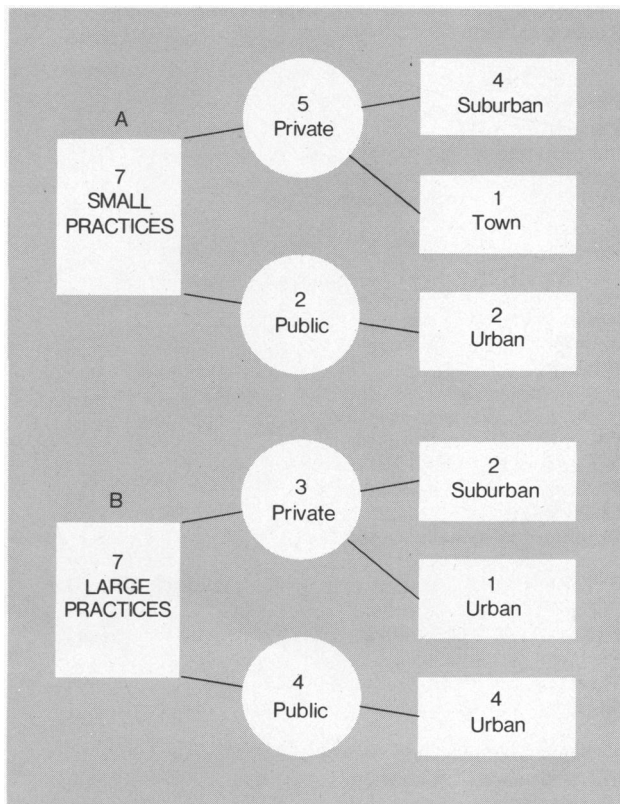
14 practices, 10 on the West Coast and 4 on the East Coast. The size, sponsorship, and location of the practices are shown in the chart. The task analysis was used by approximately 55 dentists and 123 auxiliaries performing 26,752 patient care tasks in 7,000 patient visits.

This self-generated data collection system can be used in a variety of dental settings, ranging from solo private practices to group and clinic settings in any location. The versatility of the system establishes the potential for comparisons of the delivery of dental care in practices of divergent types.

Patient-personnel interaction in 26,752 tasks. To demonstrate the personnel performance of tasks, the data collected in these 14 practices are presented according to composite personnel; that is, the dentist represents all dentists studied, and so. This discussion is limited to general practices. Specialists and specialty practices are not included. (Although characteristic of the 14 practices studied, the observations are not assumed to be characteristic of dentistry in general.)

The members of the dental team and their proportionate involvement in 26,752 patient care tasks were as follows:

Size, sponsorship, and location of 14 dental practices



NOTE: Small practice—less than 3 full-time equivalent dentists; large practice—3 or more full-time equivalent dentists; private practice—owned by 1 or more dentists (corporation or partnership); public practice—a nonprofit corporation, a community corporation, or a government facility.

Personnel	Number of tasks	Percent of tasks
Dentist and dental assistant	13,858	51.8
Dental assistant	4,200	15.7
Dental hygienist	3,986	14.9
Dentist	3,531	13.2
Dental assistant and dental assistant .	722	2.7
Dental hygienist and dental assistant.	294	1.1
Dentist and dental hygienist	161	.6

As expected, the predominant personnel combination engaged in patient care was the dentist and dental assistant—almost 52 percent of all tasks recorded in the study. The second most frequent interaction was the dental assistant with the patient—about 16 percent of all tasks. The dentist and dental hygienist interaction

with the patient represented less than 1 percent of all tasks. The dental hygienist and dental assistant interaction also occurred infrequently.

Task-personnel interaction. A specific task-level view is needed to understand the performance of dental personnel. The table delineates the task-personnel interaction in these practices from two viewpoints: (a) one provider with patient and (b) more than one provider with patient.

The most time-consuming task performed by the dentist in solo patient interaction was intraoral examination, and it represents 14 percent of all this provider's time spent in patient care. The dental hygienist spent 38 percent of solo patient care interaction performing

Five most time-consuming dental care tasks by personnel in 14 practices

Personnel and task	Total tasks		Total time		Mean number of minutes
	Number	Percent	Minutes	Percent	
Total, dentist	2,090	58	7,402	47
Perform intraoral examination	648	18	2,238	14	3.5
Prepare tooth, filled restoration	354	10	1,742	11	4.9
Perform scaling or prophylaxis	114	3	1,415	9	12.4
Administer intraoral infiltration and block	897	25	1,402	9	1.6
Provide patient consultation	77	2	605	4	7.9
Total, hygienist	2,832	71	29,097	85
Perform prophylaxis	1,109	28	13,004	38	11.7
Perform scaling	807	20	10,674	31	13.2
Instruct patient on flossing	355	9	2,101	6	5.9
Instruct patient on brushing	355	9	1,882	6	5.3
Apply acid fluoride phosphate gel	206	5	1,436	4	7.0
Total, dental assistant	1,487	35	10,885	51
Use visual aids	116	3	3,268	17	28.2
Instruct patient on brushing	355	8	2,583	11	7.3
Perform prophylaxis	199	5	1,768	8	8.9
Instruct patient on flossing	310	7	1,735	8	5.6
Bitewing	507	12	1,531	7	3.0
Total, dentist and assistant	6,293	46	33,348	52
Fill and carve restoration	2,466	18	15,715	24	6.4
Prepare tooth, filled restoration	2,486	18	11,399	18	4.6
Perform intraoral examination	686	5	2,662	4	3.9
Chart condition of teeth	522	4	1,904	3	3.6
Prepare tooth, cast restoration	133	1	1,668	3	12.5
Total, dental assistant and dental assistant	492	69	6,978	80
Fill and carve restorations	257	36	3,896	45	15.2
Polish filled restorations	38	5	840	10	22.1
Perform prophylaxis	39	5	783	9	20.1
Place rubber dam, multiple teeth	89	13	735	8	8.3
Perform oral hygiene index	69	10	724	8	10.5
Total, hygienist and dental assistant	164	56	662	55
Fill and carve restoration	28	10	202	17	7.2
Use sealant	48	16	161	13	3.4
Acid etch	52	18	113	9	2.2
Chart condition of teeth	18	6	95	8	5.3
Obtain medical and dental history	18	6	91	8	5.1

prophylaxis, which conforms to the usual expectation. Interestingly, the most time-consuming task for the dental assistant in these practices was using visual aids for patient education. This task represents 17 percent of this provider's patient care time and indicates an important role for the dental assistant in preventive services. Four of the five most time-consuming tasks performed by the dental assistant were in preventive services, and they accounted for 44 percent of this provider's total patient care time.

The table also shows combinations of personnel working at the five most time-consuming tasks. As shown in the preceding text table, the dentist and dental assistant represent the most prevalent combination interacting in patient care. Of the five most time-consuming tasks, fill and carve dental restorations comprise 24 percent of all patient care time used by this mix of personnel. This particular task can be considered appropriate for task reallocation in certain States.

The other combinations, dental assistant plus dental assistant and dental hygienist plus dental assistant, occurred less frequently in these practices. However, when these skill types work in combination, their task patterns are different than when they interact as solo providers with the patient. Operative tasks become more frequent. Although these combinations occurred in only two practices, it is an indication of how these skill types are being used currently.

When the provider combinations of task performance time are examined, the dentist and dental assistant performing fill and carve restoration (6.4 minutes) are considerably faster than two dental assistants performing this task (15.2 minutes). The data for the personnel mix of two dental assistants was supplied by one practice, and these data are for comparison only. It was noted that when a hygienist and a dental assistant perform the task, the mean time is 7.2 minutes. Naturally, 28 recorded tasks provide only a small indication of this personnel mix in relationship to the task. In general, when one considers the mean performance times of the various provider combinations, it must be kept in mind that the more tasks recorded, the more important the time factor, and vice versa.

Conclusion

The task analysis dental information system can be applied in a wide range of practice settings to study personnel utilization. The methodology primarily yields information on patient care tasks and generates a unique feedback report—a mechanism that gives the practitioner a view of task-oriented personnel patterns as they exist in his practice. With a report on task frequency, time expended, and provider involvement, he can see the relationship of one task to the total context of patient care within a given dental practice. Informed decisions may thus be made and new ap-

proaches developed about the most appropriate use of task allocation. The system can also be used to monitor and evaluate changes as they are incorporated into the practice.

NOTE: Copies of the forms discussed in this paper are available from the authors.

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