



NDRI-PR 69-06
2 June 1969

AD 689788

A Study of a Circular Dental Clinic Employing Advanced Practice Methods

LLOYD M. ARMSTRONG
BARRY E. SHARROW
PAUL O. WALKER
BOBBY J. PRIEST
GORDON H. ROVELSTAD

This document has been approved for public release and sale;
its distribution is unlimited.

NAVAL
DENTAL RESEARCH
INSTITUTE

NAVAL DENTAL RESEARCH INSTITUTE
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS 60088

2 June 1969

A STUDY OF A CIRCULAR DENTAL CLINIC
EMPLOYING ADVANCED PRACTICE METHODS

By


Lloyd M. Armstrong
Barry E. Sharrow
Paul O. Walker
Bobby J. Priest
Gordon H. Rovelstad

Research Progress Report NDRI-PR 69-06
Work Unit M4114.04.3002
Bureau of Medicine and Surgery
Department of the Navy
Washington D.C. 20390

The opinions expressed herein are those of the authors and cannot be construed as reflecting the views of the Navy Department or the Navy Service at large. The use of commercially available products does not imply endorsement of these products or preference to other similar products on the market.

This document has been approved for public release and sale; its distribution is unlimited.

Approved and released by:


GORDON H. ROVELSTAD
CAPTAIN, DC, USN
Officer in Charge

A STUDY OF A CIRCULAR DENTAL CLINIC
EMPLOYING ADVANCED PRACTICE METHODS

INTRODUCTION

The development of a five-chair circular dental clinic to support dental treatment requirements of military recruits was described in a previous research report.¹ Preliminary data was presented to a selected group of Naval Dental Officers at a Workshop on Operatory Design and Equipment Layout in February of 1968.² The purpose of this report is to present the results of clinical testing and to evaluate the newly-established methods of practice as supported by the circular clinic design.

MATERIALS AND METHODS

For the purposes of comparison, two five-chair clinics were constructed and tested. One clinic was circular in design and was designated as the Experimental Clinic. The other clinic consisted of conventional dental operating rooms and served as the Control Clinic for the study.

Control Clinic

The Control Clinic was equipped with the most modern conventional dental units and chairs that were available from the Armed Forces Stock Catalog. Each operating room was staffed with one dental officer and one dental assistant. Practice methods were patterned after current methods of established practice with the following exceptions:

1. Each dental operating room was equipped with a dry-heat sterilizer and an autoclave to insure the proper sterilization of instruments and burs.
2. To provide for a continuous supply of sterile instruments, three sets were supplied to each dental operating room.
3. It was required, to support high quality performance, that the rubber dam be applied routinely for all operative procedures.

Staffing requirements for the Control Clinic consisted of a total of five dental officers and five dental assistants.

Experimental Clinic

The Experimental Clinic contained non-standard dental equipment including the prototype dental unit (Fig. 1). It was staffed with one dental officer and one chair-side dental assistant for each operating room. In addition, there were two other dental assistants assigned; one served as a rotating dental assistant who delivered supplies and materials to each operating team, and the other was assigned to process and sterilize all of the instrument packs for the Experimental Clinic. The total staffing requirements for this clinic consisted of five dental officers and seven dental assistants.

Auxiliary Personnel

Dental auxiliaries utilized in the study were Navy enlisted personnel who had successfully completed the requirements for, and had received, the rating "Dental Technician." A total of twenty-nine of these staff personnel, with varying degrees of experience, were rotated through both clinics. Each was fully trained to perform all conventional aspects of dental assisting.

Dental Officer Personnel

Dental officers participating in the study were recent dental school graduates who had been assigned

to the Naval Training Center, Great Lakes, for duty. These officers were assigned and rotated through the Research Clinic by the Director of the Dental Department. Dental officers and dental auxiliaries were assigned and rotated independently of each other.

Patients

Dental patients were Navy recruits assigned to the Research Clinic on the basis of availability, and the need for treatment. There were no other selective procedures employed in assigning patients to a clinic or to an individual operatory. Patient treatment consisted of restoring carious surfaces either with silver amalgam or cement silicate. Patient treatment was considered to be complete when all carious lesions were permanently restored. The rubber dam was employed for all patients in both clinics and was applied prior to any high-speed instrumentation. A sampling of patients was examined with panorex radiographs to determine the completeness of treatment. The concept of complete treatment for each patient was employed in an attempt to dispel the 'one tooth' concept.

Definition of Terms

Productive time--this was the amount of time the dentist actually spent treating the patient. It included administering an anesthetic, applying the rubber dam, preparing cavities, and placing and finishing the restoration. It did not include time consumed seating and dismissing patients, examining dental records, or cleaning and sterilizing instruments.

Surfaces restored--this was the actual number of major tooth surfaces included in a restoration. For example, an MOD was recorded as three surfaces, an MO was recorded as two surfaces, and a class III silicate was recorded as one surface.

Recording Data

In the Control Clinic, the dental assistant recorded the treatment in the patient's dental record and the dental officer initialed the record. The assistant also recorded the time treatment began and the time treatment was completed. In the Experimental Clinic, dental treatment and the time treatment began and ended were dictated into a microphone and recorded on a magnetic belt. The information was then transcribed onto the proper form by research personnel.

Test Periods

Clinical testing extended for six months, beginning in August, 1967, and ending in January, 1968. Testing periods were of one week duration each with an overall total of twenty-three weekly test periods. A total of twenty-seven dental officers participated in the tests. Of this number, four operated only in the Control Clinic, eight operated only in the Experimental Clinic, and fifteen dental officers operated in both clinics. No more than ten dental officers were assigned to the study at any given time, that is, five in the Control and five in the Experimental Clinic.

Appointment Periods

The length of appointments were varied. In some instances patients were appointed on an hourly basis, and in other instances a pool of patients was supplied and each individual operating team would determine the length of treatment time depending upon the

operator's professional judgment. In all cases, the productive time per patient was interpreted as the length of the appointment.

Data Collected

At the end of each weekly test period, the following recorded data was tabulated for each dental officer:

1. Number of patients seated and treated:
2. Tooth surfaces restored
3. Productive time in minutes

The following computations were then recorded which were averages based upon one week's test:

1. $\frac{\text{Productive Time}}{\text{Surfaces Restored}}$ = Productive Time Per Surface
2. $\frac{\text{Productive Time}}{\text{Patients Seated}}$ = Productive Time Per Patient
3. $\frac{\text{Productive Time Per Patient}}{\text{Productive Time Per Surface}}$ = Surfaces Restored Per Appointment

Dental officer performance was expressed in terms of "Productive Time Per Surface."

Clinical Comparison

The results of the study were based upon these comparisons:

1. Total dental officer performance--Control Clinic versus Experimental Clinic
2. Individual dental officer performance--Control Clinic versus Experimental Clinic
3. Dental officer performance utilizing varying lengths of appointments--Control Clinic versus Experimental Clinic
4. Dental officer performance as related to length of experience--Control Clinic versus Experimental Clinic
5. Cost of instruments and equipment--Control Clinic versus Experimental Clinic

RESULTS

Overall Clinical Comparison

Nineteen dental officers were assigned for a total of 102 weekly test periods in the Control Clinic, and 23 dental officers were assigned for a total of 103 weekly test periods in the Experimental Clinic (Fig. 2). A total of 3,474 patients were seated by all dental officers during the entire test (Table I). This consisted of 2,006 patients in the Control Clinic, and 1,468 in the Experimental Clinic. A total of 166,000 minutes productive time was required--85,429 minutes in the Control Clinic and 81,171 minutes in the Experimental Clinic--to restore 14,677 tooth surfaces of which 6,524 were in the Control Clinic and 8,153 were in the Experimental Clinic. The productive time per surface for the Control Clinic was 13.1 minutes, and for the Experimental Clinic it was 9.9 minutes. Irrespective of the individual dental officer, length of experience, speed of operator, number of patients, appointment length, etc., the comparison of the productive time per surface indicated that the Experimental Clinic was 32 percent more efficient than the Control Clinic. This increase was directly attributed to an improved clinic design that supported modern practice methods and a more efficient use of additional auxiliary personnel.

Individual Performance of Dental Officers

Fifteen dental officers operated in both the Control Clinic and the Experimental Clinic as indicated

in Fig. 2. In the Control Clinic, 1,683 patients were seated, and a total of 5,582 surfaces were restored in 72,209 minutes productive time. In the Experimental Clinic, 1,034 patients were seated, and 5,930 surfaces were restored in 58,132 minutes productive time. The productive time per surface for the Control Clinic was 12.9 minutes, and for the Experimental Clinic it was 9.8 minutes (Table II).

The individual performance of the 15 dental officers who participated in both clinics is shown in Fig. 3. One dental officer, #12, in eight weekly test periods, seated 133 patients in the Control Clinic and restored 358 surfaces in 8,577 minutes productive time compared to four weekly test periods in the Experimental Clinic where he seated 61 patients and restored 199 surfaces in 4,034 minutes productive time. Productive time per surface in the Control Clinic was 24 minutes compared to 20.3 minutes per surface in the Experimental Clinic. Similar data for each of the 15 dental officers is shown in Table III. The greatest variable in the clinical test was the individual dental officer performance. Some dentists are extremely fast and capable of high volume production while others operate at a much slower rate of speed. The results of this study have been presented for each individual dentist in order to rule out this variable. The overall performance of the 15 dental officers closely paralleled the results of the six-month test in which all 27 dental officers participated.

While the graph in Fig. 3 clearly illustrates the wide variation in performance of dental officers, it is still significant that each dental officer was more efficient in the Experimental Clinic than he was in the Control Clinic. The range of performance was 1 percent more efficient for dental officer #10, to 57 percent for dental officer #9, with an overall increased efficiency of 32 percent for the Experimental Clinic.

Performance Versus Length of Experience

Individual dental officer performance, in terms of productive time per surface, is shown in Table IV and compared to his length of experience in each clinic. For example, dental officer #1 spent five weeks operating in the Control Clinic. His first week's performance was 12 minutes per surface. The second week his performance was 11.3 minutes, and so on until his fifth week's performance was 13.3 minutes per surface. His length of experience in the Experimental Clinic was four weeks. The first week his performance was 8.9 minutes per surface, the second week 7.1, the third week 9.8, and the fourth week 9.6. Similar data is shown for all 15 dental officers tested. In the Control Clinic 6 of the 15 officers were less efficient the second week than they were the first week, and 8 officers were less efficient the last week of testing than they were the first. This would indicate that all test periods were significant in the Control Clinic and that very little time was required for each dentist to adapt to his environment. In the Experimental Clinic, 6 officers were less efficient the second week than they were the first week, and 8 officers were less efficient the last week than they were the first week. This would indicate that very little time was required for the dental officer to adapt himself to the environment of the Experimental Clinic and that all test periods were significant with respect to experience.

Performance Versus Length of Appointments

Individual dental officer performance was compared to length of appointments (productive time per patient) which was recorded in 10-minute gradations

from 20 minutes to 110 minutes (Table V). One dental officer, #7, operating in the Control Clinic, required 14.6 minutes productive time per surface for 40-minute appointments, 14 minutes productive time for 50-minute appointments, 14.4 for 60-minute appointments, and 15.2 minutes for 70-minute appointments. In the Experimental Clinic he required 12 minutes productive time per surface for 40-minute appointments, 13.5 minutes productive time for 50-minute appointments, and so on, until during his 70-minute appointments 11.7 minutes were required. Similar data regarding each of the 15 dental officers and length of appointments is shown in Table V. In the Control Clinic, of three dental officers who recorded 20-minute appointments, two were more efficient than when recording longer appointments. Of 10 officers who recorded 30-minute appointments, 6 were most effective for this length of time. Of 12 officers who recorded 40-minute appointments, 4 were more efficient, and of 6 officers who recorded 50-minute appointments, two were more efficient.

The overall or combined performance of the 15 dental officers compared to length of appointments is illustrated in Fig. 4. During 40-minute appointments, 12 dental officers operating in the Control Clinic required 12 minutes productive time per surface compared to 9.7 minutes for 10 officers operating in the Experimental Clinic. When the length of appointments was increased to 50 minutes, 6 dental officers in the Control Clinic required 17.6 minutes per surface in contrast to 6 dental officers in the Experimental Clinic who required only 8.8 minutes per surface. The general trend is that dental officers in the Control Clinic are less efficient as the length of appointment time increases. In the Experimental Clinic, whereas the general trend is for efficiency to decrease slightly as appointment time increases, still longer appointments appear to be considerably more efficient in the Experimental Clinic than in the Control Clinic.

The underlined productive times in Table V indicate the appointment lengths in the Control Clinic that have matching appointment lengths in the Experimental Clinic for each dental officer. These data have then been illustrated in Fig. 5 where a total of 19 individual graphs are shown involving 10 dental officers and appointment lengths of 20, 30, 40, 50, 60, and 70 minutes. The bar on the left in each graph represents productive time per surface in the Control Clinic. The bar on the right indicates productive time per surface in the Experimental Clinic. For example, dental officer #17 operated 20, 30, and 40-minute appointments in both clinics. In each case he was more efficient in the Experimental Clinic. Dental Officer #12 operated 40, 60, and 70-minute appointments in both clinics. He was less efficient in the Experimental Clinic during 40-minute appointments, but was more efficient in the Experimental Clinic during 60 and 70-minute appointments. Of 9 dental officers who recorded 40-minute appointments in both clinics, five were less efficient in the Experimental Clinic (solid bars) than in the Control Clinic. In all other instances, regardless of the dental officer, or the length of appointment, the Control Clinic was less efficient than the Experimental Clinic.

Production Results

There has always been a wide variation of opinion as to the proper length of dental appointments. From the data presented in Table II the following impressions may be drawn as indicated in Table VI. The average length of appointments for the 15 dentists that operated in the Control Clinic was 42.9 minutes. The productive time per surface was 12.9 minutes and on the average, 3.3 surfaces were restored per

patient per appointment. In the Experimental Clinic, the average length of appointments was 56.2 minutes, or a 13-minute increase over the Control Clinic. The productive time per surface was 9.8 minutes, and on the average, 5.7 surfaces were restored per patient per appointment. In other words, there was an increase of 73 per cent in the amount of dental service delivered to the patient in the Experimental Clinic compared to the Control Clinic. This indicates that where time is of the essence and there are large numbers of patients to be treated, the use of longer appointments is valid, especially when the patient is comfortable and the operating teams are prepared to provide multiple services per appointment. A great saving of time was accrued to the patient and the operator by offering longer appointments and multiple procedures per appointment.

Cost of Equipment

In the Control Clinic, items of equipment included the following: Dental Unit, Dental Chair, Operating Light, Dental Cabinetry, Dental Handpiece (high-speed), Dental Handpiece (slow-speed), Operator's Stool, Assistant's Stool, Steam Sterilizer, Dry Heat Sterilizer, Amalgamator, and Waste Receptacle. The cost of this equipment for one dental operating room was \$5,259.73 (Table VII). The cost for five dental operating rooms was \$26,298.65. Instrument packs were supplied, three to a room, at a cost of \$84.45 each. The total cost of instrument packs was \$1,266.75. The total cost of the equipment and instruments for the five-chair Control Clinic was \$27,565.40.

In the Experimental Clinic, items of equipment were non-standard and included the following: Dental Unit, Operating Tray, Dental Chair, Operator's Stool, Assistant's Stool, Tray Stand, and Operating Light. The cost of the equipment for one dental operating room was \$2,131.06. The cost for five dental operating rooms was \$10,655.30. Instrument packs were supplied, three to a room, at a cost of \$98.48 each. Fifteen such packs totaled \$1,477.20. Handpiece packs contained high and low speed handpieces, and a three-way syringe and were supplied, three packs to a room, for a total cost of \$5,385.00. Linen packs for draping patients were supplied, three to a room, for a total cost of \$167.40. Gown and glove packs were supplied six to a room for a total cost of \$116.40. The rotator's stand with amalgamators and the scrub sink (8 feet long) cost \$819.08. The total cost of equipment and instruments for the five-chair Experimental Clinic was \$18,620.38.

The difference in cost of equipment and instruments for the two clinics was \$8,945.02, or 48 percent more for the Control Clinic. The requirement for a central sterilization room capable of meeting all sterilization needs of the Experimental Clinic cost a total of \$6,734.30 for equipment. If this additional equipment cost were added to the cost of the Experimental Clinic it would total \$25,354.68. The difference would then be \$2,210.72, which is still an 8.7 percent increase in cost for the Control Clinic.

It should be pointed out that these figures for the Experimental Clinic include the cost of sterilizing equipment that could conceivably support at least four times the load. Also, these figures represent the cost of three times as many handpieces and three-way syringes as were supplied for the Control Clinic.

DISCUSSION

Dental officer performance, measured in terms of

productive time per surface restored, appears to be a very accurate method of measuring the efficiency of a dental practice. Not all dental procedures involve restoring teeth, but by and large, any management designed to promote efficiency in this area could be applied equally as well to all forms of dental treatment. It was the purpose of this study to develop clinical design and treatment methods that could support all dental service. These considerations were especially emphasized with regard to cross-contamination and aseptic methods of practice, allaying apprehensions and improving comfort for the patient, reducing fatigue and emotional stress for operator personnel, and increasing utilization of auxiliary personnel.

It should be emphasized that the dental assistants were military personnel, young men and women fulfilling their military obligations, and highly dedicated to the principles of the Navy Dental Corps. They were well-trained to perform the duties of a general dental assistant, but had received no training in the art of supporting operating teams utilizing an aseptic technique in four-handed dentistry, or in the methods of operating a central sterilization room. They were well-trained, but unfortunately, career incentives had tended to lure them away from the dental operating room. This is particularly manifest when one considers that in order to advance in rate, a dental technician has to enter into the area of administration, laboratory work, dental repair, etc. It was very stimulating to observe that dental assistants are keenly aware of the value of complete dental service and take great pride in their duties. It would be desirable to assure them of proper advancement within the military structure by evaluating their continued performance as chair-side assistants. This is a problem that must be resolved in the future.

The dental officers were required to conform to a changed concept of practice; however, this proved to be no great problem. They were required to sit down while operating and to instruct their assistants to also sit down. Each operating team was trained to properly scrub, and to gown and glove for each patient. This in itself is a wide departure from the conventional method. The transfer of microorganisms via saliva contamination, aerosols, and instruments constitutes a hazard to staff personnel and cross-contamination between patients. It was found that all officers could provide full treatment while wearing rubber gloves, e.g. placing of the rubber dam.

Instruments were placed in individual packs and delivered to the operating teams for use. They were removed after use to the central sterilizing room for processing and sterilization. Instruments were selected for quality and durability and ability to withstand repeated sterilization. Packs were designed to support the required treatment and all dental officers were requested to use the packs as supplied. This conformity also proved to be no obstacle to the dentist and emphasizes once again the almost natural adaptability to an ideal situation.

Perhaps the greatest change for dental officers was developed in the Experimental Clinic by simply bringing the dentist, the patient, and the dental assistant together in a surgically clean environment. All their needs could be supplied through the use of the rotator. This afforded an opportunity for private, uninterrupted, dental treatment and was made possible through modified facilities design, improved equipment layout, improved assignment of auxiliary personnel, and improved methods of practice. It is important to note that the dentist did not withdraw his hands from the operating field during

the entire operating period; instead, the dentist was given the opportunity to apply his knowledge and skill as a well-trained dental surgeon in a manner that would most effectively improve the oral health of each individual patient whom he treated. It was toward this concept that all designs, routines, and methods of the study were directed in an effort to more effectively meet the dental treatment requirements of Navy recruits. The productive treatment time required to restore a tooth surface was only a method of providing tangible evidence of some degree of success. The 32 percent increase in the efficiency of the Experimental Clinic would tend to support the integrity of these changes.

An interesting result of this study was presented in Table III. Here dental officer #9 required 57 percent longer to restore a surface in the Control Clinic while dental officer #10 required only 1 percent longer. This is a wide variation in results with different individuals. Also it will be noted that dental officer #17 required 5.8 minutes to restore a surface in the Experimental Clinic while dental officer #12 required 20.3 minutes, or three and one-half times as long. These data point out the possible fallacy of considering numbers of restorations placed as a means of measuring or comparing professional responses among dental officers. Production should be considered merely a by-product of any efficient dental practice, not its goal.

This study tested the practice of longer dental appointments when required. This was made possible by the valuable contribution to dentistry of the contour dental chair with a straight thin back which has made it possible to place the patient in a more comfortable supine position for longer periods of time than was ever possible before. With the dental officer and the dental assistant trained to operate from a comfortable seated position, they too were more comfortable over extended periods of patient treatment. The data in Table VI show that a 56.2-minute productive session with the patient results in an end product of 5.7 surfaces restored. There are many dental patients who may receive all their required operative treatment, as well as other required treatment, in one appointment.

The reduced costs for equipment and instruments is the result of developing only those items required to support effective treatment methods. It appears that with a slight alteration in a standard dental clinic of its facilities and personnel utilization, dental standards and dental ethics could be maintained at a very high level without increasing costs, and still provide high quality dentistry for 32 percent more of our untreated personnel.

CONCLUSIONS

Since 1942 it has been the goal of the Dental Corps to provide all dental treatment required to maintain the oral health of the Navy and Marine Corps personnel. This is a commendable goal and many newly-licensed dentists have been commissioned in the reserves and called upon to help perform this task. Recent studies have indicated that the demand for dental service far exceeds the supply. It must be evident that not all personnel are being maintained in good oral health. A dilemma has been created by many attempts to define and solve the problems that exist. Out of this dilemma has arisen a clinical research study that is based upon the original goal of the Navy Dental Corps. The methods involved resulted in a 32 per cent increase in efficiency which led to the following conclusions:

1. The Experimental Clinic developed for this study (Fig. 6) could be employed as a "module" concept for

further studies in facilities planning and group practice clinics. The design supports professional teamwork and optimum use of available auxiliary personnel. It employs only the most modern practice methods including the aseptic practice of dentistry. It requires minimal fixed equipment and less expense, and provides a proper atmosphere for meeting oral health requirements. The reduced equipment costs and increased production benefits the dental service economically.

2. A 32 per cent increase in efficiency is interpreted as providing dental treatment to 32 per cent more patients. This increased effort could be added to our present effort, and it would considerably lessen the untreated oral health load. Further testing would develop acceptable methods for reaching the original goal. It is recommended that the techniques employed in this study be emphasized and adhered to in an approach to further investigations.

3. Dental officers should be given the opportunity to treat patients in an environment that utilizes professional knowledge to its fullest and they should be encouraged to increase and expand this knowledge. Dental officers are well-educated and with proper consultation and guidance from more experienced dental officers, can become highly proficient in providing all but the most complicated forms of dental treatment. The methods employed in this study are recommended to eliminate the indifference of some junior dental officers in a recruit training center, an attitude that has a tendency to influence their performance. The results of this study indicated that all patients were properly treated and not one case was managed in a perfunctory manner.

4. The training required by the dental officer for this study was minimal but it does point out the necessity for some immediate form of professional consultation which assists him in clinical practice. Professional seminars are a constant source of support for high degrees of performance. It was also found that dental officers and dental assistants appreciate training in the care and maintenance of dental equipment, in methods for providing cleanliness of dental spaces, in procurement of supplies and materiel, in records management, and in the art of working together and depending upon each other. Personnel also appreciated being briefed upon policies and activities of the Dental Corps, the mission of the dental team, and the overall needs of the service. This philosophy of training generated respect for the profession and the individual and indicated that best efforts of staff personnel would be greatly appreciated. The dental officer is motivated by the service he can provide and the recognition he receives for this service.

5. The dental assistant should be given the same concept of dental practice and should be trained to support the dentist in efficient productive methods. Personnel of this type are usually young and inexperienced, and therefore, in each module there should be an older more experienced assistant to act as the leader or captain of the team. The care of dental patients should reign supreme, and those who provide this care should be given full recommendation for promotional status. The success of a module such as this depends upon the proper motivation of staff personnel.

SUMMARY

A circular five-operatory dental clinic was developed and tested. This clinic was of experimental design. Many items of prototype equipment were developed to support modern practice methods. Personnel utilization and practice methods were slightly

altered from present practice. During 6 months of testing a total of 15 dental officers provided operative dentistry treatment to Navy recruits in a Control and an Experimental Clinic. Based upon the time required to restore a tooth surface, each dentist was more efficient in the Experimental Clinic than when tested in a standardized Navy Dental Clinic. This efficiency ranged from 1 to 57 percent with a mean of 32 percent. The average length of dental appointments in the Control Clinic was 43 minutes. In the Experimental Clinic it averaged 13 minutes longer with a resultant increase in production of 73 per cent. The tests indicated that as the length of appointments increased, the Experimental Clinic became increasingly more efficient than the Control Clinic. It is recommended that the five-chair Experimental Clinic serve as a "module" concept for future planning of facilities design and treatment methods.

ACKNOWLEDGEMENTS

Appreciation is expressed to the following who assisted materially in the clinical research study:

- (1) The 27 dental officers and 29 dental technicians assigned by the Director, Dental Department, Naval Administrative Command, Naval Training Center, Great Lakes, Illinois.
- (2) Navy Medical Research Unit #4, Great Lakes, Ill.
- (3) DTI B.J. Priest, USN
- (4) DTI John Schilski, USN
- (5) DTI S.W. Shelton, USN
- (6) LT B.E. Sharrow, DC, USN
- (7) LT P.O. Walker, DC, USNR
- (8) Dr. I.L. Shklair, Chairman, Editing Committee

REFERENCES

1. Armstrong, L.M., Rovelstad, G.H., and Longton, R.W.: Dental Operatory Equipment and Clinical Design to Support Advanced Concepts of Dental Practice, Naval Dental Research Institute, Progress Report, 67-03, 30 Aug 1967.
2. Armstrong, L.M., Sharrow, B.E., Walker, P.O., and Rovelstad, G.H.: Workshop on Dental Operatory Design and Equipment Layout, Naval Dental Research Institute, Progress Report, 68-05, 15 Nov 1968.
3. Naval Dental Research Institute, Workshop on Recruit Dental Treatment--unpublished.

PROTOTYPE STERILIZABLE UNIT FOR EXPERIMENTAL D O R

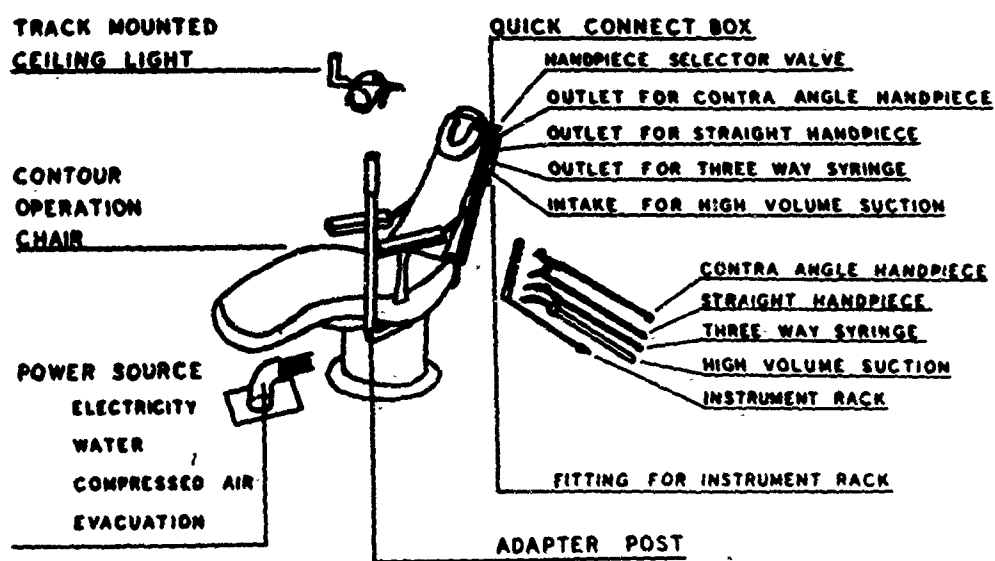


Fig. 1 Artist's drawing of component parts of prototype dental unit.

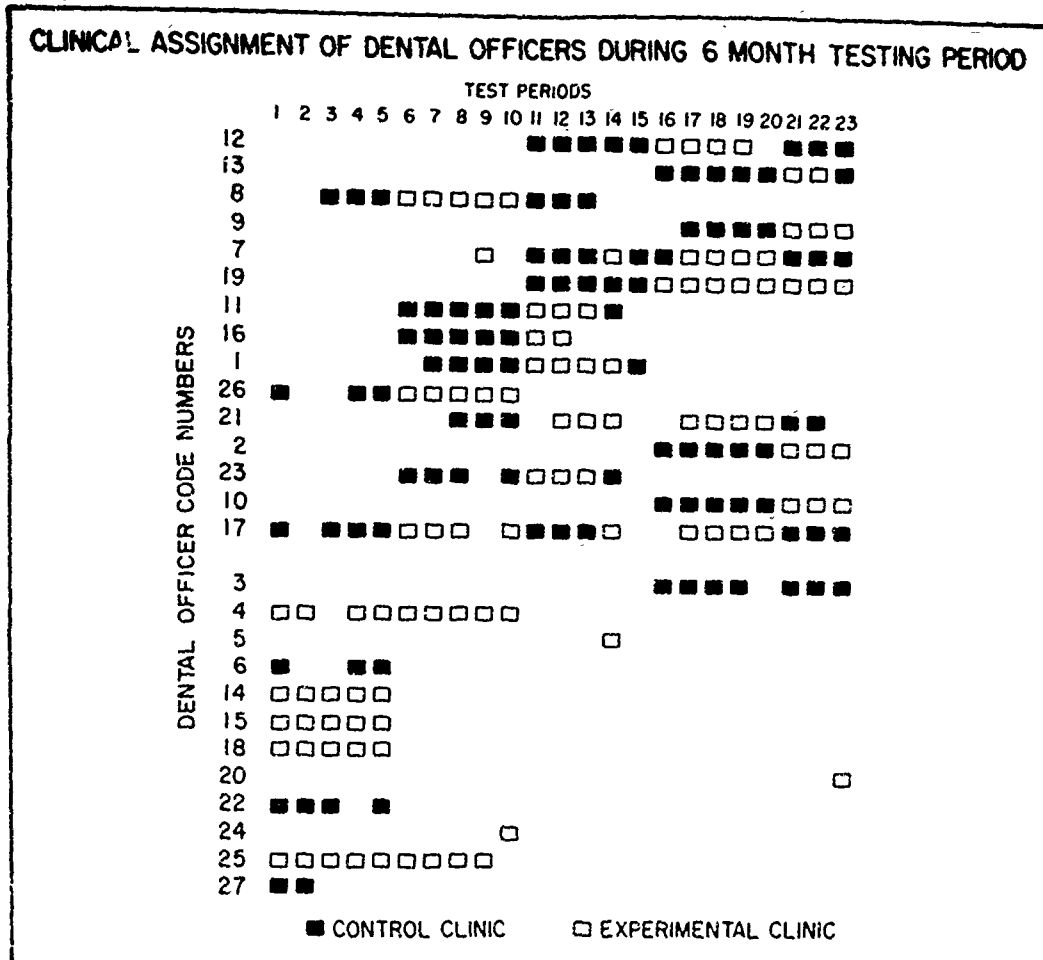


Fig. 2 Dental officer assignment to Control Clinic and Experimental Clinic during twenty-three weekly testing periods

COMPARISON OF EXPERIMENTAL CLINIC VERSUS CONTROL CLINIC DURING SIX-MONTH TESTING PERIOD*

	<u>CONTROL</u>	<u>EXPERIMENTAL</u>
PATIENTS TREATED	2,006	1,468
SURFACES RESTORED	6,524	8,153
PRODUCTIVE TIME	85,429	81,171
PRODUCTIVE TIME PER SURFACE	13.1	9.9

* 27 DENTAL OFFICERS PARTICIPATED IN TEST

Table I Overall clinical test

COMPARATIVE DATA OF 15 DENTAL OFFICERS' EFFICIENCY IN THE CONTROL CLINIC VERSUS THE SAME 15 DENTAL OFFICERS' EFFICIENCY IN THE EXPERIMENTAL CLINIC

	<u>CONTROL</u>	<u>EXPERIMENTAL</u>
PATIENTS TREATED	1,683	1,034
SURFACES RESTORED	5,582	5,930
PRODUCTIVE TIME	72,209	58,132
PRODUCTIVE TIME PER SURFACE	12.9	9.8

Table II Overall performance of fifteen dental officers who were tested in both clinics

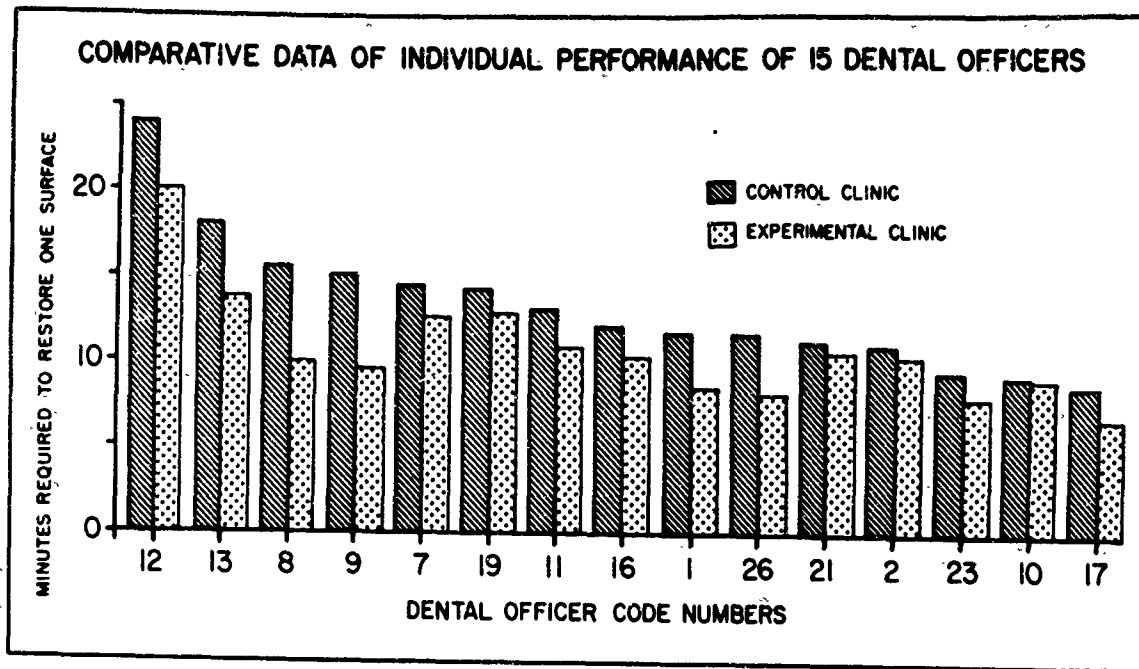


Fig. 3 Individual clinical comparison of fifteen dental officers

COMPARATIVE DATA OF INDIVIDUAL PERFORMANCE OF 15 DENTAL OFFICERS					
DENTAL OFFICER CODE NO.	CLINIC	PATIENTS SEATED	SURFACES RESTORED	PRODUCTIVE TIME	PRODUCTIVE TIME PER SURFACE
12	CON	133	358	8,577	24
	EXP	61	199	4,034	20.3
13	CON	87	327	5,866	17.9
	EXP	29	163	2,246	13.8
8	CON	97	279	4,249	15.2
	EXP	50	279	2,904	10.4
9	CON	92	295	4,457	15.1
	EXP	39	187	1,797	9.6
7	CON	145	496	7,253	14.6
	EXP	106	488	6,007	12.3
19	CON	113	318	4,573	14.4
	EXP	135	647	6,377	9.9
11	CON	133	401	5,068	12.6
	EXP	42	283	3,086	10.9
16	CON	108	299	3,658	12.2
	EXP	28	205	2,115	10.3
1	CON	115	279	3,366	12.1
	EXP	67	426	3,773	8.9
26	CON	67	165	1,987	12
	EXP	62	324	2,782	8.6
21	CON	114	376	4,315	11.5
	EXP	129	717	7,796	10.9
2	CON	105	442	4,926	11.1
	EXP	33	213	2,240	10.5
23	CON	102	417	3,998	9.6
	EXP	36	370	3,148	8.5
10	CON	103	485	4,472	9.2
	EXP	37	253	2,296	9.1
17	CON	169	645	5,440	8.4
	EXP	160	1059	6,118	5.8

Table III Individual performance of fifteen dental officers who operated in both clinics

PROGRESSIVE PERFORMANCE* OF FIFTEEN DENTAL OFFICERS																				
DENTAL OFFICER CODE NO	WEEKLY TESTING PERIODS																			
	CONTROL CLINIC										EXPERIMENTAL CLINIC									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
12	20.4	27.5	26.3	28.1	24.4	23.6	20.5				21.8	18.7	18.8							
13	18.5	19.6	19.6	20.6							13.5	14.2								
8	17.5	12.6	13	15.8	18.2						10.2	10.6	9.7							
9	15.6	14.8	12.7								9.2	8.6								
7	13.7	15	16.6	14	15.2	14.4	12.3				10.6	12.2	13.7	12	13.3	13.4				
19	12.9	14.9	16.9								11.1	9.6	8.4	8.3	10.2	8.4				
11	13	12.9	15	13							12	10.8	10.2							
16	11.7	13.9	11.3	11.7							9.9	10.9								
1	12	11.3	14.6	10.6	13.3						8.9	7.1	9.8	9.6						
26	16.1	9.3	14.8								6.6	7.7	10.1	8	8.3					
19	14.9	12.3	12.9								11.5	9.8	11.2	15.2	11.1	9.6	9.4			
2	10.3	9.9	11.1	15.3	10.4						10.4	10.4	11.3							
23	9	10.4	9.4	9.4	9.6						7.5	8.6	9.4							
10	10.4	8.6	10.8	7.5	9.8						9	7.2	12.6							
17	8.1	7.1	7.6	15.2	7.4	7.9	8.7	8.6	8.1	12.3	8.5	5.5	4.8	5.7	7.2	6.7	6.8	6.3	5.7	4.5

*EXPRESSED IN PRODUCTIVE TIME (MINUTES) REQUIRED TO RESTORE ONE SURFACE

Table IV Individual performance compared to length of experience in each clinic

PERFORMANCE* OF FIFTEEN DENTAL OFFICERS WITH RESPECT TO PRODUCTIVE TIME PER PATIENT																				
DENTAL OFFICER CODE NO.	PRODUCTIVE TIME PER PATIENT (LENGTH OF APPOINTMENT)																			
	CONTROL CLINIC										EXPERIMENTAL CLINIC									
	20	30	40	50	60	70	80	90	100	110	20	30	40	50	60	70	80	90	100	110
12			17.0	27.5	28	26	24.3		24.0				18.7	21.8	25.5			18.8		
13			16.7	17.5				20.6							13.8					
8		12.6	15.1	18.2									15.8	9.9	10.6					
9			14.6		16.4						8.6		9.9							
7			14.6	14.0	14.4	15.2							12.0	13.5	12.2	11.7				
19		12.7	17.1								8.9	9.6	9.1	10.2		11.6				
11		10.9	12.9											10.8	10.2			12.0		
16		12.2												9.9				10.9		
1	11.2	14.6	13.3											7.9	9.6		9.8			
26	9.3	15.4											7.9	8.8						
21		13.3	9.3											10.1						
2			10.5		15.3									11.3		12.8	11.5		9.8	
23		9.0	9.8	10.0											10.4					
10		7.5	9.8	10.4													7.5	9.4		
17	9.1	8.2	8.5											12.6	7.2	9.0				
											6.1	5.6	5.7	5.9						
ALL	10.1	11.1	12.0	17.6	17.7	19.7	24.4		20.6	23.6	7.3	6.4	9.7	8.8	11.0	12.0	9.1	10.5	18.8	9.8

*EXPRESSED IN PRODUCTIVE TIME (MINUTE) REQUIRED TO RESTORE ONE SURFACE

Table V Individual performance compared to length of appointment in each clinic

OVERALL PERFORMANCE OF 15 DENTAL OFFICERS WITH RESPECT TO PRODUCTIVE TIME PER PATIENT (LENGTH OF APPOINTMENT)

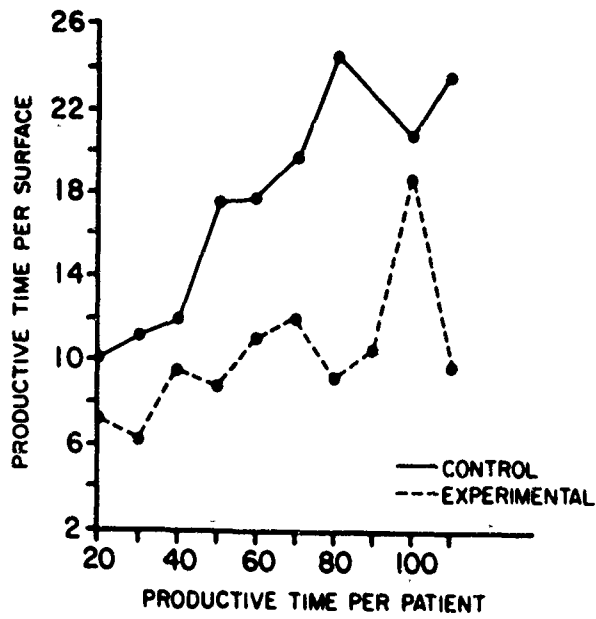


Fig. 4 Overall performance in each clinic compared to length of appointment

COMPARATIVE PERFORMANCE OF TEN DENTAL OFFICERS WITH RESPECT TO LENGTHS OF APPOINTMENTS

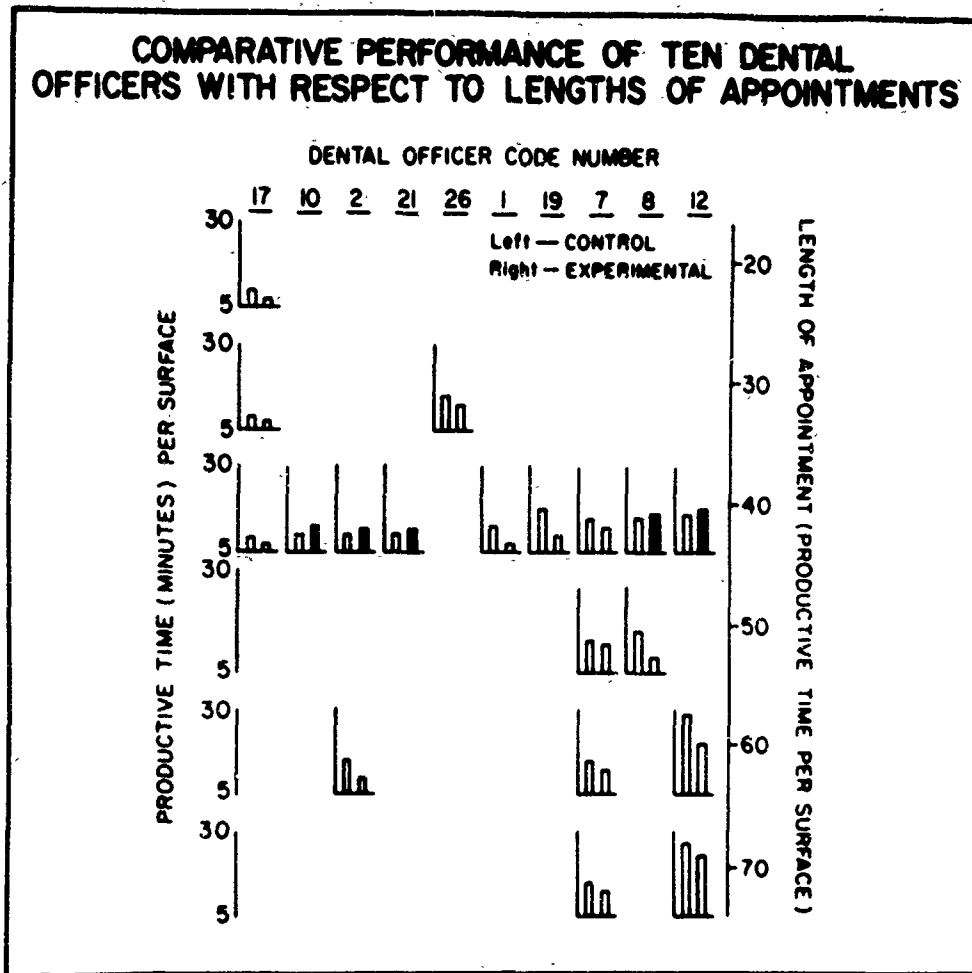


Fig. 5 Clinical comparison of the performance of ten dental officers utilizing appointment times of equal length in each clinic. (Black bars indicate instances where Experimental Clinic was less efficient than the Control Clinic)

COMPARISON OF SURFACES RESTORED PER PATIENT PER APPOINTMENT*

	<u>CONTROL</u>	<u>EXPERIMENTAL</u>
PRODUCTIVE TIME PER PATIENT	42.9	56.2
PRODUCTIVE TIME PER SURFACE	12.9	9.8
SURFACES PER PATIENT PER APPOINTMENT	3.3	5.7

*DATA BASED ON RESULTS SHOWN IN TABLE II

Table VI Total average surfaces restored per appointment in each clinic

<u>CONTROL CLINIC</u>		
Equipment for one DOR	\$5,259.73	
Instruments for one DOR (Three packs @ \$84.45)	253.35	
Total cost of one DOR		\$5,513.08
Total cost of Control Clinic (five DORs)		\$27,565.40
<u>EXPERIMENTAL CLINIC</u>		
Equipment for one DOR	2,131.06	
Instruments for one DOR (Three each of the following: operative, handpiece, linen, gown and glove for operator and assistant @ \$476.40)	1,429.20	
Total cost of one DOR		3,570.26
Total cost of five DORs		17,851.30
Rotator stand equipment		819.08
Central Sterilization Room equipment		6,734.30
Total cost of Experimental Clinic		\$25,354.68

Table VII: Cost analysis of equipment and supplies

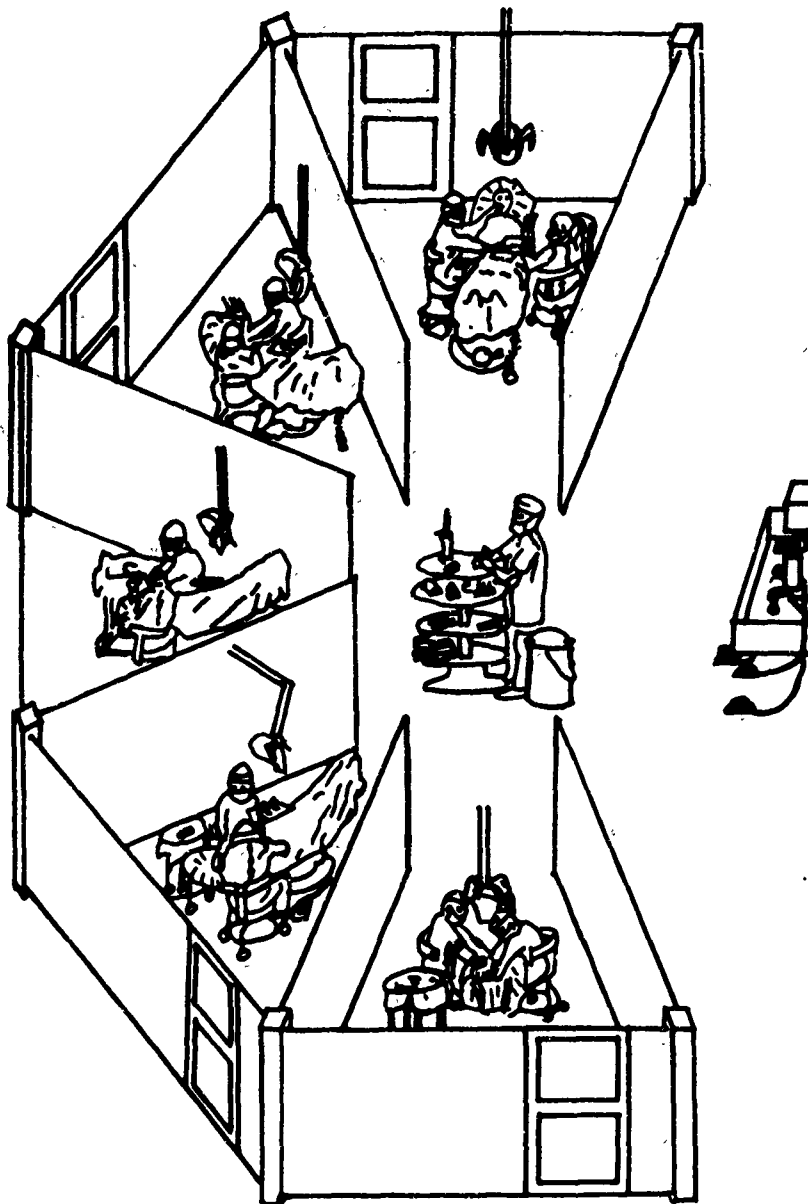


Fig 6 Artist's drawing of the Experimental Clinic

DOCUMENT CONTROL DATA - R & D		
<i>(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)</i>		
1. ORIGINATING ACTIVITY (Corporate author) Naval Dental Research Institute Naval Training Center Great Lakes, Illinois 60088		2a. REPORT SECURITY CLASSIFICATION Unclassified
		2b. GROUP
3. REPORT TITLE A STUDY OF A CIRCULAR DENTAL CLINIC EMPLOYING ADVANCED PRACTICE METHODS		
4. DESCRIPTIVE NOTES (Type of report and inclusive dates)		
5. AUTHOR(S) (First name, middle initial, last name) Lloyd M. Armstrong / Barry E. Sharrow / Paul O. Walker / Bobby J. Priest / Gordon H. Rovelstad		
6. REPORT DATE 2 June 1969	7a. TOTAL NO. OF PAGES 18	7b. NO. OF REFS 3
8a. CONTRACT OR GRANT NO.	9a. ORIGINATOR'S REPORT NUMBER(S) NDRI PR 69-06	
b. PROJECT NO. MF12.524.012.0004	9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)	
c.		
d.		
10. DISTRIBUTION STATEMENT This document has been approved for public release and sale; its distribution is unlimited.		
11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY Naval Dental Research Institute Naval Training Center Great Lakes, Illinois 60088	
13. ABSTRACT <p>A clinical research study was initiated to determine the efficiency of an Experimental Dental Clinic. Methods of practice were employed that met the following basic requirements: (1) surgically clean environment; (2) dentist and assistant teamwork; (3) versatile patient treatment, and (4) reduced stress and strain. A circular five-chair operating suite was developed to support the sharing of a rotating dental assistant. A compact dental unit was developed to replace the conventional dental unit. All instruments were sterilized in individual packs and delivered to the operatories as needed. The clinic was staffed with five dentists and seven auxiliaries. A conventional five-chair Control Clinic was staffed with five dentists and five auxiliaries. Fifteen dental officers rotated through both clinics. The number of surfaces restored and the actual time spent in placing the restorations was recorded. In the Experimental Clinic a total of 5,930 surfaces required an average of 9.8 minutes productive time each, compared to 5,582 surfaces in the Control Clinic that required 12.9 minutes per surface. This represents a 32 per cent increase in surfaces restored in the Experimental Clinic with the addition of one dental auxiliary to serve as a rotating dental assistant and one to sterilize the instrument packs.</p>		

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Experimental Dental Clinic Patient Treatment Dental Officer Efficiency Dental Auxiliaries Four Handed Dentistry New Dental Equipment Dental Instrument Sterilization						