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Following specialized training in which naval dental assistants were taught to insert restorations in cavities prepared by dental officers, clinical tests were applied to determine how much more a dental officer can accomplish when he delegates certain procedures to specially trained assistants, to evaluate the quality of the restorations, and to determine the mental and physical effects on the personnel when operating under these conditions for prolonged periods. In the clinical tests the following systems were employed: (1) one officer and two assistants operating at one chair and utilizing conventional treatment procedures, (2) one dental officer and three assistants at two chairs, (3) one dental officer and four assistants at three chairs, (4) one dental officer and five assistants at four chairs. In the latter three systems, the assistants placed restorations in cavities. Two dental officers operating in the most satisfactory three-chair system increased their productivity by more than 100 percent; a third increased in productivity by 80 percent. Short term evaluations found restorations placed by the dental teams comparable to those placed by the conventional methods, and no adverse mental or physical effects when the three-chair system was utilized for 20 weeks. A related document is VT 005 732. (JK)

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GREATER UTILIZATION OF DENTAL TECHNICIANS

II. Report of Clinical Tests

Dental Research Facility
U. S. Navy Training Center
Great Lakes, Illinois

GREATER UTILIZATION OF DENTAL TECHNICIANS

II. Report of Clinical Tests

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INDEX

In the first report of this study the details of the specialized training given to 12 naval dental technicians were presented.[1] In seven weeks the technicians were taught to insert amalgam or silicate restorations in cavities which had been prepared by dental officers. A random sample of the restorations inserted during the training program was evaluated by three examiners. Since it was observed that the technicians could insert satisfactory restorations, they were considered to be properly prepared for a series of clinical tests. The objectives of the tests were to determine how much more operative treatment a dental officer could accomplish when delegating certain treatment procedures to trained technicians, to evaluate the quality of the restorations inserted, and to determine the mental and physical effects on the dental officers and technicians when operating under these conditions for prolonged periods.

The purpose of this report is to describe the clinical tests and to explain how three dental officers and 12 technicians operated as treatment teams. Appendix A presents the entire experimental design for the clinical tests.

CLINICAL TEST A

This 12-week test was designed to measure the operative productivity of a dental officer when operating under a variety of conditions. The authors (L, S, and K) were assigned to one of three different operative systems and the assignments were changed weekly until they had operated under each system four times. The following three operating systems were tested:

System 1. One dental officer and two technicians operating at one chair and utilizing conventional treatment procedures.

System 2. One dental officer and three technicians operating at two dental chairs with the technicians placing the restorative materials in the cavities prepared by the dental officer.

System 3. One dental officer and four technicians operating at three chairs with the technicians placing the restorative materials in the cavities prepared by the dental officer.

The patients were naval personnel stationed at Great Lakes and the majority of them required eight restorations. Eight was the average number of restorations personnel required at the time of entrance into the naval service. The patients usually had cavities of a moderate size or less and required either one, two, or three-surface restorations. For the purpose of this study, effort was made to treat cavities which could be

classified as routine, or of moderate complexity. As a rule, badly broken down teeth, requiring large complicated restorations, were referred to another clinic for restoration by dental officers with routine technics.

Each patient reported to the clinic with bite-wing roentgenograms and a preliminary diagnosis. There were 18 patients scheduled for treatment in the morning and 15 in the afternoon.

The dental officer operating at one chair was scheduled to treat four patients in the morning and three in the afternoon. He accomplished all the treatment himself and did not delegate any treatment procedures to his technicians. The amount of treatment completed was recorded and this became the foundation for comparison of treatment accomplished at two and three chairs.

The dental officer operating at two chairs and delegating certain operative procedures to his technicians was scheduled to treat six patients in the morning and five in the afternoon. He limited his services to making the final diagnosis, administering the local anesthetics, and cutting and severing the hard and soft tissues involved in the treatment of carious teeth. During the time he was preparing the cavities, the technician assigned to the chair worked as his assistant. The technician would seat the patient, get the instruments ready, and perform those duties which an assistant normally performs. When the cavity preparations were completed, the dental officer gave the technician specific instructions for the treatment procedures the technician was to accomplish. In the event a base was required, the dental officer specified the type of material to be used and gave directions for its placement. After the base was inserted by the technician and was checked by the dental officer, the technician applied a matrix to each tooth that required one and inserted the prescribed restorative materials. In the case of silicate restorations, the technicians used sharp instruments to trim away the excess material and to establish contour. Abrasive linen strips were also used in the interproximal areas. For the amalgam restorations, the technicians used an assortment of amalgam carvers to establish the proper contour and occlusion.

After the technician had completed his assignment, the dental officer checked all restorations, as he alone was responsible for the entire treatment. If a restoration was not acceptable, the dental officer directed the technician to replace it. In those cases where the dental officer believed the treatment procedure was beyond the capability of the technician, the officer either did the treatment or gave direct assistance to the technician. In the early phases of this test every procedure was checked by the dental

officer, but as the skills of the technicians increased, the final checking was primarily limited to the completed restorations.

Pulp exposures were usually treated by the dental officer. However, in a few instances, the more competent technicians placed the pulp capping materials under the supervision of the dentist.

During the time the technician was placing the restorations, the dental officer moved to the second chair and started treating another patient. The technician assigned to the second chair assisted the officer and inserted the restorative materials after the cavity preparations had been made.

Since the dental officer had three technicians on his treatment team but only two chairs available, the third technician served as a roving assistant. This technician's duties were to mix and to pass the restorative material to the technicians who were inserting the restorative materials and to assist in any other way possible. So that the technicians would have equal experience in restoring teeth, each one served as the roving assistant every third day.

In the three-chair system the dental officer also delegated the same treatment procedures. He operated at three chairs and was assisted by four technicians. The same pattern was followed as for the two-chair system except that eight patients were scheduled for the morning and seven for the afternoon.

All treatment procedures were recorded in the patient's dental health record but were not signed by the dental officer who was responsible for the treatment. Instead of affixing his signature in the dental health record, a code number was used such as "Great Lakes - 228". Code numbers were also used by seven other dental officers in another clinic who used only conventional treatment procedures. These dental officers served as the controls for the dental officer-technician teams.

In order to evaluate the quality of the restorations inserted by the dental officer-technician teams or by the seven control dentists, an evaluation form was developed and inserted into the dental health record of every patient treated. The form, Appendix B, requests that the restorations be examined one year after placement and be rated as satisfactory or unsatisfactory. It is realized that this is a very broad method of evaluating restorations and that there is a difference among examiners as to what constitutes a satisfactory restoration. Nevertheless, past experience with this two-rating system has yielded definitive data which could be analysed.

Early in Clinical Test A it became apparent that some patients scheduled for treatment were unable to keep their appointments. While this did not occur every day, it did occur frequently enough to become a problem in measuring the productivity for a day. Broken appointments often ranged from 3 to 24 per cent. On some occasions other patients could be made available but this was not always possible. Therefore, daily work rates were not used in measuring productivity. Instead, hourly work rates were calculated as broken appointments only reduced the number of hours worked for a day.

Since broken appointments were a major problem, it is believed that an explanation is due. One of the reasons was that some military assignments took priority over the scheduled dental appointments. While every possible effort was made to keep this to a minimum, in a training activity which processes approximately 50,000 personnel a year, some scheduling errors do occur. Sickness on the day of the appointment and forgetting appointments were other causes. However, the broken appointments for this study were no different than those experienced in the clinics where conventional treatment procedures were employed.

During the fourth, fifth and sixth weeks of the test, dental officer G substituted for S and operated at one, two and three chairs. The treatment accomplishments of G are included for this test.

After the twelfth week, an analysis was made of the three systems used in this test. Table 1 shows that all four of the dental officers accomplished the most treatment when operating at three chairs and were delegating certain operative procedures to the trained technicians. Not only was there more treatment accomplished, but twice the number of patients were treated. The increases in productivity ranged from a low of 74 per cent for dental officer K to a high of 120 per cent for L.

The two-chair system showed increases over the one-chair system, but the dental officers were not being fully utilized during the day. Some treatment time was lost each day by the dental officers as they had to wait for the technicians to place the restorations. In the case of the three-chair system, the dental officers were gainfully employed for the greater part of each day.

Table 1 also indicates that there were marked differences in the operating capabilities of the dental officers. The average number of restorations inserted per hour varied among the officers. Since each officer was being tested to determine how much more work he could accomplish when he delegated some of the treatment procedures, his actual operating speed was not an important factor.

CLINICAL TEST B

In view of the fact that the one-chair operation was the least productive of those tried in Clinical Test A, it was eliminated. The second 12-week test was designed to determine how many chairs a dental officer could operate efficiently. The original three dental officers (L, S, & K) operated at two, three and four chairs on a weekly schedule. All other conditions remained the same except that the dental officer operating at four chairs had five technicians and was scheduled to treat ten patients in the morning and eight in the afternoon.

During this test it was again necessary to make substitutions for two of the three dental officers. Dental officer F substituted for L for a three-week period and had an opportunity to try the two, three and four-chair systems. Dental officer KK substituted for K during a week in which the four-chair system was being tested.

All dental officers were able to operate at four chairs and to treat the number of patients scheduled. Approximately 20 minutes of the dental officer's time could be allotted to each patient. This included the time to make the final diagnosis, to inject the local anesthetic, to prepare the cavities and to check the restoration before dismissing the patient. Not only were the officers extremely busy treating the patients, but it was necessary for them to wash their hands approximately 60 times a day. This averaged three times for each patient: before making the final diagnosis and injecting the local anesthetic, before operating, and before examining the completed restorations. Cleansing the hands was a greater factor in the four-chair operation than in the two or three-chair operation and was a time factor that was not anticipated.

Table 2 depicts the productivity for all the officers who participated in the test. Greater emphasis should be placed on the values for L, S, and K when assessing this test as the values for F and KK were for shorter periods, and they did not have the advantage of using this system of treating patients prior to the time they served as substitutes. Nevertheless, the values for F and KK permitted other comparisons which would not have been otherwise possible.

The average number of restorations L inserted per hour at two and three chairs was about the same as for the previous test. However, S showed a marked increase over his previous trials at two and three chairs. It is of interest to observe that his second trial at the three-chair system produced a 139 per cent increase over his one-chair operation. Perhaps additional experience with this type of treatment system was the factor which accounted for the increases shown by S.

Both officers had increases at four chairs over their best three-chair operations.

The average number of restorations inserted per hour for K was almost the same regardless of whether he operated at two, three or four chairs. This indicates that some officers may reach a peak at a two-chair operation and that the cost of operating at the third chair would not produce increases sufficient to justify the additional costs involved. K's peak insertion rate was 3.5 per hour which is a 84 per cent increase over his one-chair operation. When KK substituted for K during a week in which the four-chair system was being tested, KK averaged 6.7 restorations per hour. This is considered especially significant since he operated with K's technicians and illustrates that the relatively low productivity was characteristic of K, not his technicians.

The values for dental officer F are also given in Table 2. It is of interest to note that his work rates approximate those of L and S. It was impossible to calculate his increase over a one-chair operation as this information was not obtained during clinical test A. The values for KK and F are included in order to present all the data accumulated.

The four-chair system taxed the energies of the dental officers. The technicians were not being fully utilized because they were frequently waiting for the dental officers to cut the cavities.

At the end of this 12-week test, dental officers L, S, and K had tried the four-chair system for either three or four weeks and agreed that a continuous assignment would be very stressful. The three-chair system was, therefore, judged to be the best of those tested.

Eleven well-known civilian dentists were invited to visit Great Lakes. The purpose of the visit was to orient these dentists with the objectives of the study and to seek their assistance in evaluating groups of patients who had either been treated by the dental officer-technician teams or by dental officers using only conventional treatment procedures. The invited included two deans of dental schools who serve as dental consultants to either the Department of Defense or to the Department of the Navy, four professors of operative dentistry, three representatives of the American Dental Association, and representatives of the Illinois State Dental Society and the Illinois State Board of Dental Examiners. The names and organizations of those invited are given in Appendix C. Since neither of the Chairmen for the Councils on

Dental Education and the Federal Dental Services could attend, Professor R. V. Brown of Marquette University Dental School, represented these two councils.

It was impossible to select a date which was convenient for the nine consultants planning to visit the study. Therefore, it was necessary to schedule the briefing for two dates. Seven attended the first briefing. The objectives of the study were explained and it was pointed out that the Navy was conducting the study in accordance with the guide lines set forth by the American Dental Association.[2, 3, 4] Following the briefing, the consultants toured the clinic where the research teams were treating patients. All consultants had an opportunity to observe the treatment procedures in progress and to inspect the completed restorations. In some cases the consultants viewed the completed restorations before the dental officer responsible for the treatment had checked the restorations. Thus, some restorations were evaluated by the consultants before the responsible dental officer had approved them.

After observing the dental officer-technician teams for more than an hour, the consultants were taken to another clinic to examine the patients who had either been treated by one of the teams or by dental officers using conventional treatment procedures. There were 30 companies, with approximately 80 recruits to a company, available for examination. Two days before the visit, one consultant had been asked to select three companies for evaluation. After he had made his selection, 15 random recruits from each company were scheduled for the evaluation. Only 37 of those scheduled presented themselves on the date of the consultant's visit.

The seven consultants independently examined the 37 recruits and scored the completed restorations (not the cavity design) as either satisfactory or unsatisfactory. The examinations were made with the aid of mouth mirrors, explorers, and a dental light. The consultants were told that bite-wing roentgenograms would be made for any or all of the patients, but none were requested.

After the examinations had been completed, the results were tabulated by the consultants. A tentative rating for a restoration was determined when four or more of the seven consultants concurred. Then the envelope containing the code for the evaluation was opened and, for the first time, it was possible for the consultants to separate the patients into three groups. One group had been treated by the dental officer-technician teams and the other two groups had been treated by dental officers using conventional procedures. In one of these two control groups the dental officers knew that their restorations were going to be evaluated at a later date (known control) but in the

other control group the dental officers did not know that their restorations would be evaluated (unknown control).

The final scores for the restorations were determined two weeks later when the other two consultants examined the same patients. In a few instances their scores changed the tentative values established by the first seven consultants. Therefore, the final scores represented the opinion of five or more of the nine consultants. With the exception of one patient treated by one of the officer-technician teams, there were no appreciable differences in the number of satisfactory restorations for the three groups of patients. For the patient in question, three of the five silicates placed by a team were considered unsatisfactory by five of the consultants, while four consultants found them satisfactory.

The number of unsatisfactory amalgam restorations was: one for the dental officer-technician teams, two for the known control group and three for the unknown control group, indicating that the experimental restorations were comparable in quality to those placed by conventional methods.

All the consultants were invited to make verbal comments about the study after the evaluations had been completed. A summary of their comments is contained in Appendix D. Also, they were invited to submit written reports, which five of the consultants did. Permission to reproduce their reports and to include them was obtained, Appendices E through I. One consultant submitted his report to the American Dental Association, not to this activity. Perhaps others elected to report to the Association in this manner.

CLINICAL TEST C

The three-chair system was found to be the most satisfactory one tried in the previous tests. Therefore, it was the only one used in Test C, which was designed to determine the ability of dental officer-technician teams to operate at this pace for 12 consecutive weeks. All other conditions were the same as for the other three-chair tests.

The dental officers and technicians did not find the three-chair system fatiguing or stressful and the same increases remained in the productiveness over the one-chair system. There were 3709 restorations placed and the hourly work rates were 7.0 for L, 6.5 for S, and 3.4 for K.

Figure 1 presents the productive values for Clinical Tests A, B, and C for dental officers L, S, and K and for the substitutes. It will be noted that the productivity for the authors remained fairly constant

for the two and three-chair systems. As has been mentioned before, on occasions it was necessary to make a substitution for one of the authors for short periods of time. Without exception, the substitutes established values approximating those of L and S and exceeding those of K.

At the conclusion of Clinical Test C another evaluation of the restorations inserted by either the experimental teams or two control groups was made. The accomplishment of eight dental officers comprised the known control group and the work of six dental officers made up the unknown control group. The examiners were seven naval dental officers who had not operated on the experimental teams or in either control group. They examined 67 patients, 23 had been treated by the experimental teams and each control group had treated 22 patients. This evaluation was similar to the one described in Clinical Test B with the exception that the restorations were rated as unsatisfactory, fair, good or excellent, Appendix J. The change to a four-rating system was in keeping with one of the suggestions made by the civilian consultants.

While the four-rating system provided more sophisticated rating values than a two-rating system, it produced greater divergencies among the examiners. The scores ranged from unsatisfactory to excellent for nine per cent of the restorations and there was unanimous agreement for only four per cent of them.

It was possible to determine the final score for 82 per cent of the restorations when four or more of the seven examiners concurred. For 11 per cent of the restorations, a final score was assigned when one rating received three votes and the other four votes were spread among the other rating categories. The other seven per cent of the restorations received three votes in two categories and the seventh vote was used to establish a majority.

Table 3 shows that the quality of the restorations inserted by the experimental group rated very favorably when compared to those inserted by the dental officers in the known control group. Thirty-three per cent of the restorations for both of these groups had a final score of excellent. This is in contrast to only 11 per cent excellent for the dental officers in the unknown control group. The experimental and known control groups had a slightly better quality rating for their restorations than the unknown control group. This suggests that if dental officers know that their restorations are going to be examined and compared they may stress quality a bit more.

The number and types of restorations evaluated are presented in Table 4. Fifty-four of the 152 restorations had been placed by the experimental group, 45 by the known control group, and 53 by the unknown control group. The average number of restorations placed per patient was computed. The values for the experimental and unknown control groups were slightly higher than the value for the known control group. The quality and quantity for the restorations inserted by the experimental group were comparable to the quality of the known control group and the quantity of the unknown control group. This demonstrates the value of having two control groups for studies of this type.

DISCUSSION

The Royal Canadian Dental Corps has conducted a study similar to this study. Their pilot study demonstrated that it was possible to train auxiliary personnel to accomplish certain of the more routine treatment procedures and, thus, more fully utilize the professional skills of dentists.[5,6] The candidates selected for specialized training had a minimum of three and a half years experience as clinical technicians. They were given 16 weeks of training and the subjects taught included restorative dentistry, periodontics, prosthodontics, oral surgery, and public health dentistry. Upon completion of the training, they were designated "Technician Dental Therapists". The therapists were made a component of dental treatment teams. A team consisted of a dental officer, a therapist, a chair-side assistant, a roving assistant and a clerical assistant. Three treatment rooms were utilized by a team. Two were equipped for any type of treatment and the third contained equipment necessary for the therapist. They had a dental productivity increase from 110.2 time points per duty day (one dental officer working with one assistant) to 219.4 when the full dental team was functioning. This was almost 100 per cent increase in productivity.

In our study we limited the training to certain operative procedures which we thought the technicians could accomplish under the supervision of a dental officer and we did not include training in any other field of dentistry.

In the Canadian study there were two key members on a treatment team, the dental officer and the therapist, whereas, in this study the dental officer was the only key member of the team and it was possible to replace him without seriously disrupting the function of the team. The substitution of a dental officer on a team usually was accomplished by having the substitute observe the operation for an hour or two until he became oriented. Having four fully trained technicians on our teams gave us flexibility in operating during the absence of a technician due to sickness or leave. During these times the technicians worked

without the assistance of a roving technician and helped each other as much as possible.

The number of restorations that a dental officer-technician team can place during one day is dependent on many factors. The most important of these are the operative skills of the dental officer and the capability of his technicians. Also, the type of patients being treated is another important factor. It was found that the ideal patients for this type of treatment were recruits who required four to eight conventional restorations and who had little or no previous operative treatment. The most restorations placed by a team in one day was 65. This was accomplished by S and his four technicians when operating at three chairs. He treated 15 patients and inserted 35 compound amalgams, 17 simple amalgams, and 13 silicates. This was the only day during the study that sixty or more restorations were inserted by a single team. On occasions L and S placed 50 or more restorations but usually these two officers ranged between 30 and 45. The values for K were appreciably lower and he was usually between 15 and 22 for a three-chair operation.

During the study, the research teams treated 5019 patients and inserted 10,680 restorations. The treatment accomplishments for the dental officers in the known control group were approximately the same.

We were concerned about the patient's acceptance of this treatment method. For several of the months that the study was in progress, the system was explained to the patients while they were in the waiting room. This explanation was usually given by a dental officer. Since none of the patients ever expressed any objections, this was discontinued. While the vast majority of the patients were young adults undergoing training at Great Lakes, there were a few older patients treated. Some of these had received routine dental treatment for as long as 22 years in the naval service. They accepted the treatment and many could immediately see the advantage of utilizing this system as a means of treating more patients. Many of the younger patients had never had any previous treatment so they were unable to make a comparison. Most of them assumed that this was the only way that treatment could be accomplished. Since many of our patients were told that trained technicians would be placing the restorations, this information may be related to dental officers who subsequently examined our patients. This might possibly influence his assessment of the long-term quality of the restoration.

To date only two of 5,019 patients treated by the team method have indicated less than unanimous acceptance. One naval officer received treatment and was not pleased that technicians were performing some

of the treatment procedures usually accomplished by the dentist. He did not return for further treatment and later related that one of the restorations placed had been adjudged faulty by a civilian dentist and was replaced. The patient told one of his friends about this experience and the friend avoided seeking treatment at our clinic. Another patient expressed his concern during a second appointment when he was being treated by a dental officer utilizing conventional treatment procedures. While these are the only incidents known by us, there may be others.

We are of the opinion that a dental officer, who inserts high quality restorations when operating conventionally, will continue to do so when delegating certain operative procedures to trained technicians. Delegating should not alter the quality of the restorations because the dental officer has the final responsibility and he should replace any restoration that does not meet his standard.

Early in Test A, one of the male technicians was replaced because he did not work in harmony with the other members of the team. As the study progressed, it was necessary to select replacements for three of the original five wave technicians because of marriage. The replacements were given intensive on-the-job training and filled the vacancies very well with the exception of one who lacked interest in the program. Since the vacancies occurred throughout the study, it was possible to train the replacements and gradually break them in to the program without too much trouble. It was found that females were as capable as the male technicians, but we had less difficulties with the male technicians. Perhaps our appraisal of the female technicians is biased because their replacement rate was much higher than for the male technicians.

Throughout the study it was obvious that some technicians were more capable and faster than others. If technicians of this type were selected for a team and if the dental officer could fully utilize their talents, it is conceivable that more treatment could be accomplished. Since no effort was made to assemble such a team, the productive values reported here could be surpassed.

The dental officer-technician teams operated under the three-chair system for a total of 20 weeks, four in Test A, four in Test B and 12 in Test C. The dental officers were of the opinion that it was less fatiguing than treating patients by conventional methods. The technicians enjoyed their work and only one asked to be relieved. As was mentioned before, this technician lacked interest in the program when selected and never became properly motivated. The dental officers gained a certain amount of personal satisfaction because they were able to treat more patients. In a sense this was also true for the technicians

as they knew that they were valuable members of dental health teams.

The dental officers worked less hours per day than when operating conventionally. It was necessary for them to have all the cavities prepared early enough in the morning or afternoon so that the technicians could insert the restorative materials before the end of the treatment periods. Therefore, a portion of each day was spent waiting for the technicians to complete their assignments. There was also a time in each treatment period when some of the technicians were waiting for the cavities to be prepared. When the dental officer started operating at one chair, the technicians were waiting at the second and third chairs. In the Canadian study these waiting times were used by the technicians to accomplish a scaling. The technicians in our study also worked less hours per day than they would normally work when assisting a dental officer who was treating patients by conventional methods.

The dental officers and technicians worked as teams and continued operating until all scheduled patients had been treated. It was to everyone's advantage to work as efficiently as possible in order to accomplish the treatment in the minimum amount of time. Once the scheduled patients had been completed in the morning or afternoon session, no attempt was made to obtain more patients even though additional treatment time was available. This was the incentive used to keep the teams motivated.

On occasions when a treatment session was almost over, there might be one more patient to treat. Sometimes the technicians would begin a slowdown in their work in order not to have to take the last patient. Once in a while this even caused hard feelings among them. Probably this would never occur in a system where salaries were directly related to the amount of work accomplished. While this was not a major problem, it did arise to some degree almost every day, since, in the three-chair system, there were eight patients scheduled for treatment in the morning and seven in the afternoon. If six patients were scheduled for each session, then each technician would have two patients and this problem would be eliminated. Decreasing the number of patients would permit longer appointments and might further increase the productivity of a team.

Another matter which should be considered in future tests concerns the roving technician. The roving technician was able to assist one technician at a time and frequently other technicians had to wait for him. Usually they proceeded without his assistance. Also, it was difficult to keep the roving technician gainfully employed throughout

the day as there were frequent periods when the other technicians did not require assistance. Perhaps, it would be possible for a team to work without a roving technician, particularly if less patients were scheduled for treatment.

In the final comments it should be noted that increased production quadrupled the number of technicians, tripled the number of operating chairs, and increased training. To date no comparative cost has been ascertained.

CONCLUSIONS

1. A dental officer operating at three chairs and delegating certain operative procedures to trained technicians can treat twice the number of patients and can significantly increase the number of restorations placed when compared to his one-chair productiveness. Two of three dental officers tested increased their productivity by more than 100 per cent, and the third by 80 per cent.

2. Short-term evaluations of random samples of the restorations placed by the dental officer-technician teams were found to be comparable to restorations placed by conventional treatment procedures. Delegating certain operative procedures to trained technicians did not appear to alter the quality of the treatment because the dental officer had the final responsibility and replaced any restoration not meeting his standard. The results of the long-term evaluations will be reported in early 1965.

3. Dental officers and technicians did not experience any adverse mental or physical effects when utilizing the three-chair system for 20 weeks.

Table 1. Productivity of Four Dental Officers Operating at One, Two and Three Chairs

Dental Officers	Number of Resto-rations	Number of Hours Operated	Average Restorations Per Hour	Per cent Increase Over One Chair
Dental Officer L				
One Chair	232	77	3.0	—
Two Chairs	408	81.5	5.0	67
Three Chairs	510	77.5	6.6	120
Dental Officer S				
One Chair	187	67	2.8	—
Two Chairs	202	49	4.1	46
Three Chairs	321	58.5	5.5	96
Dental Officer K				
One Chair	161	83.5	1.9	—
Two Chairs	233	95.0	2.5	32
Three Chairs	304	91.0	3.3	74
Dental Officer G				
One Chair	70	20	3.5	—
Two Chairs	92	18.5	5.0	43
Three Chairs	137	19	7.2	106
Totals				
One Chair	650	247.5	2.6	—
Two Chairs	935	244	3.8	46
Three Chairs	1272	246	5.2	100

Table 2. Productivity of Five Dental Officers Operating at Two, Three and Four Chairs

Dental Officers	Number of Restorations	Number of Hours Operated	Average Restorations Per Hour	Per cent Increase Over One Chair *
Dental Officer L				
Two Chairs	318	55	5.8	93
Three Chairs	472	68.5	6.9	130
Four Chairs	442	58.5	7.6	153
Dental Officer S				
Two Chairs	466	77.5	6.0	114
Three Chairs	477	71.0	6.7	139
Four Chairs	647	81.0	8.0	186
Dental Officer K				
Two Chairs	247	77.5	3.2	68
Three Chairs	326	94.0	3.5	84
Four Chairs	268	77.0	3.5	84
Dental Officer F				**
Two Chairs	83	23.5	3.5	— **
Three Chairs	91	21.5	4.2	— **
Four Chairs	113	20.5	5.5	—
Dental Officer KK				**
Two Chairs	—	—	—	— **
Three Chairs	—	—	—	— **
Four Chairs	164	24.5	6.7	—
Totals (L, S, and K only)				
Two Chairs	1031	210	4.9	89
Three Chairs	1275	233.5	5.5	112
Four Chairs	1357	216.5	6.3	142

* One chair values are given in Table 1.
** Dental officers F and KK did not operate at one chair during Test A and their accomplishments are not included in the totals.

Table 3. Percentage of Unsatisfactory, Fair, Good and Excellent Restorations Inserted by Dental Officer-Technician Teams or by Dental Officers *

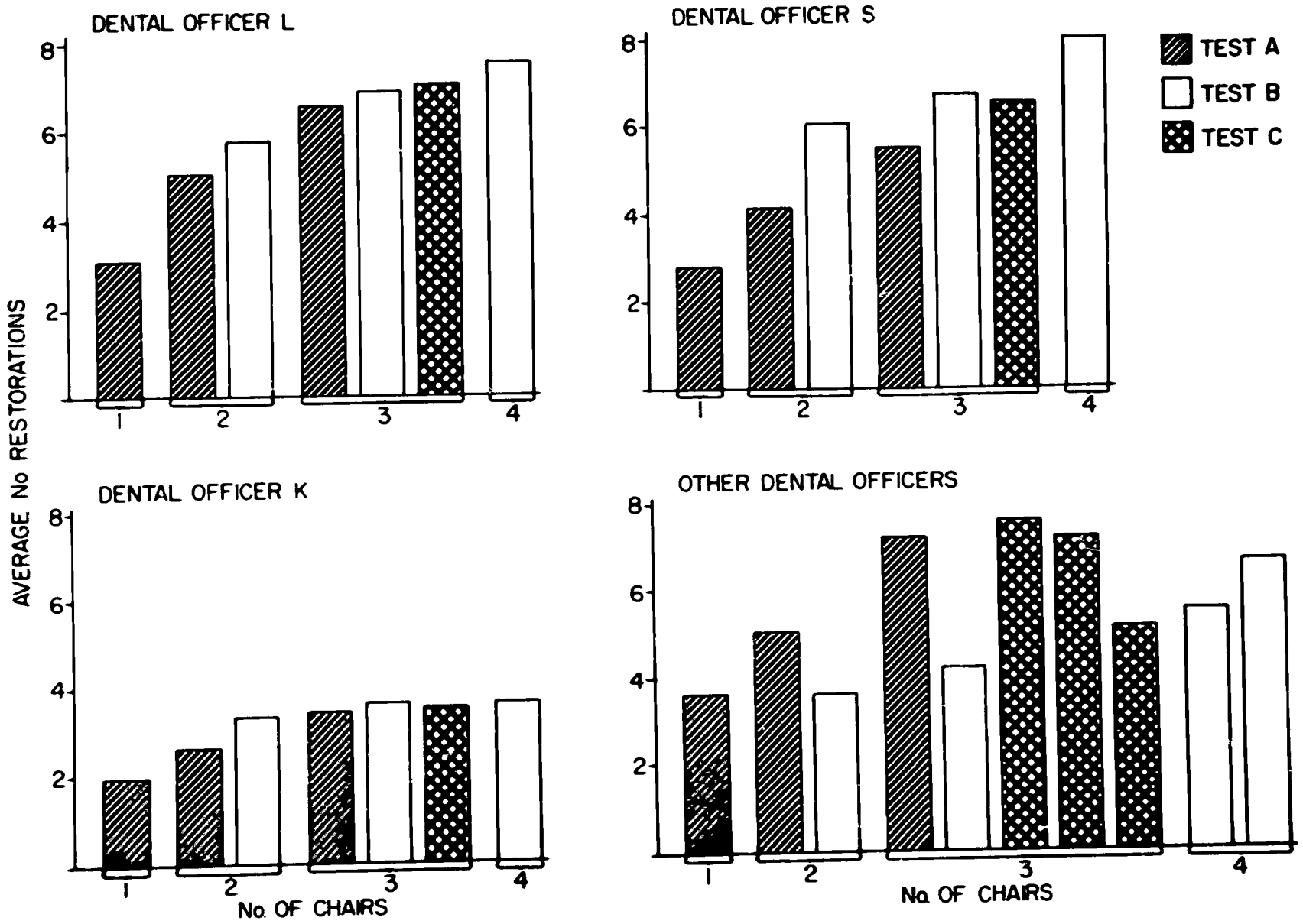
GROUPS	PERCENTAGES			
	Unsat.	Fair	Good	Excellent
Experimental Group (dental officer-technician teams). Dental officers delegating certain operative procedures to specially trained dental technicians.	2	15	50	33
Known Control Group. Dental officers utilizing conventional treatment procedures. The dental officers knew that their restorations were going to be evaluated.	2	9	56	33
Unknown Control Group. Dental officers utilizing conventional treatment procedures. The dental officers did not know that their restorations were going to be evaluated.	5	24	60	11

* Cavity preparations were not evaluated.

Table 4. Number and Types of Restorations Evaluated

GROUPS	Silicates	One Surface Amalgams	Two or More Surface Amalgams	Total Restorations	Number of Patients	Average per Patient
Experimental Group (dental officer-technician teams). Dental officers delegating certain operative procedures to specially trained dental technicians	0	23	31	54	23	2.3
Known Control Group. Dental officers utilizing conventional treatment procedures. The dental officers knew that their restorations were going to be evaluated.	5	18	22	45	22	2.0
Unknown Control Group. Dental officers utilizing conventional treatment procedures. The dental officers did not know that their restorations were going to be evaluated.	2	28	23	53	22	2.4
Totals	7	69	76	152	67	2.3

Figure I. AVERAGE NUMBER OF RESTORATIONS PER HOUR - DENTAL OFFICERS OPERATING AT ONE, TWO, THREE AND FOUR CHAIRS



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3. American Dental Association, Transactions 1961. Chicago 11, American Dental Association, page 222.

4. American Dental Association, Transactions 1962. Chicago 11, American Dental Association, page 249.

5. Baird, K. M., G. B. Shillington, and D. H. Protheroe, Pilot Study on the Advanced Training and Employment of Auxiliary Dental Personnel in the Royal Canadian Dental Corps: Preliminary Report.

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APPENDIX A

Experimental Design for Clinical Tests A, B and C

Test A

In order to determine whether the delegating of certain treatment procedures to trained technicians will increase the treatment capability of dental officers, a 12-week investigation will be conducted. Dental officers X, Y and Z will be assigned to one of three different operating systems and the assignments will be changed weekly until all the dental officers have operated each system four times.

The three operating systems are listed:

System 1. One dental officer and two technicians operating at one chair and utilizing conventional treatment procedures. This will be the control for Test A.

System 2. One dental officer and three dental technicians operating at two chairs with the technicians inserting the restorative materials in teeth which have been prepared by a dental officer.

System 3. One dental officer and four technicians operating at three chairs with technicians performing the same operating procedures as referred to in System 2.

OPERATING SCHEDULE FOR DENTAL OFFICERS X, Y & Z
BY WEEKS

Number of weeks	System 1 1 dental officer 2 technicians 1 chair Conventional treatment	System 2 1 dental officer 3 technicians 2 chairs delegating certain operative procedures	System 3 1 dental officer 4 technicians 3 chairs delegating certain operative procedures
1	X	Z	Y
2	Z	Y	X
3	Y	X	Z
4	X	Z	Y
5	Y	X	Z
6	Z	Y	X
7	Y	X	Z
8	X	Z	Y
9	Z	Y	X
10	Y	X	Z
11	X	Z	Y
12	Z	Y	X

The patients will be recruits undergoing basic training at Great Lakes who were examined upon entrance in the naval service and found to have eight or less carious teeth. They will report to the clinic in groups, 24 in the morning and 12 in the afternoon. The dental officer using conventional treatment methods will have six patients available for treatment. The dental officer operating at two dental chairs and delegating certain treatment procedures will have 12 patients available, and the dental officer operating at three chairs and delegating certain treatment procedures will have 18 patients available for treatment. In the event more patients can be treated by any dental officer, additional patients will be made available but the work must be accomplished in the chairs assigned to them for the week. On the other hand, adjustments will be made in the event that these dental officers cannot treat the number of patients projected for them. The dentists will operate six hours a day and the remaining time will be utilized for maintaining records and performing other military duties. Thus, average length of the appointments will be 60 minutes and the dental officers will be expected to accomplish as much treatment as possible for each patient. Past experience indicates that a few patients will not require a full appointment while others will require more time.

The patients will report to the clinic and bite wing x-rays will be taken if none are available. The dental officers will make the diagnosis and outline the treatment plan for the patients assigned to their service. After this has been completed, the dental officer utilizing conventional treatment procedures will start treating his patient while the other two dental officers will only prepare the teeth and the technicians will complete the restorations. After the restorations have been completed by the technicians, the dental officers concerned will examine the restorations before the patient is dismissed. In the event that any restoration is not acceptable to the dental officer, he will have it replaced as he alone will be responsible for the quality of the treatment.

The following information will be recorded each day for each dental officer:

a. Tooth surfaces restored.
b. Tooth restored.
c. Number of patients treated.
d. Number of hours operated.
e. Length of appointment per patient.
f. Average length of appointments.
g. Comments concerning days operation to include patient's reaction.

The restorations inserted will be recorded in the patient's dental record but instead of the dental officer signing his name he will use a code number such as "Great Lakes - 214". Code numbers will be used by six other dental officers using conventional treatment procedures and not associated with the study. This will permit evaluation of the quality of restorations by appointed teams or individuals on a double-blind pattern and will eliminate the possibility of biased judgements being formed. This was recommended in the Proceedings of the Workshop on the Future Requirements of Dental Manpower and the Training and Utilization of Auxiliary Personnel, presented by the University of Michigan and the W. K. Kellogg Foundation Institute, with the cooperation and assistance of the American Dental Association, American Association of Dental Schools and the W. K. Kellogg Foundation, January 15 - 19, 1962. In addition, a self-addressed card will be attached to the patient's dental health record requesting that the restorations be evaluated by dental officers examining the patients subsequently.

The code numbers assigned to the participating dental officers will become permanent records of the Dental Department and will be readily available for identifying the individual dental officers and the restorations placed by them.

The outside evaluating teams should be composed of military and civilian dentists. The military dentists can be the consultants listed on BuMed Form 98 and civilian dentists should be two members of the Council on Dental Education, American Dental Association.

Test B

In event Test A demonstrates more treatment can be accomplished when certain treatment procedures are performed by technicians, then Test B will be concerned with determining the number of chairs a dental officer can use efficiently. This will be another 12-week test and the same three dental officers will operate at two, three, and four chairs. The conventional treatment system will be eliminated from this phase. All other conditions will remain the same except that the dental officer attempting to operate at four chairs will have five technicians.

OPERATING SCHEDULE FOR DENTAL OFFICERS X, Y & Z BY WEEKS

Number of weeks	System 2 1 dental officer 3 technicians 2 chairs delegating certain operative procedures	System 3 1 dental officer 4 technicians 3 chairs delegating certain operative procedures	System 4 1 dental officer 5 technicians 4 chairs delegating certain operative procedures
1	Y	Z	X
2	Z	X	Y
3	X	Y	Z
4	Z	X	Y
5	Y	Z	X
6	X	Y	Z
7	Z	X	Y
8	Y	Z	X
9	X	Y	Z
10	Z	X	Y
11	X	Y	Z
12	Y	Z	X

Test C

The system which proves to be most efficient in Test B will be repeated by the three treatment teams for 12 consecutive weeks to determine the long-term mental and physical effects on the dental officers and technicians and to determine if the increased treatment capability can be maintained. This information will be obtained by interviews and personal experiences of the personnel concerned and from the records.

APPENDIX B

Dental Research Facility
Dental Department
Naval Administrative Command
U. S. Naval Training Center

Date_____

Dear Doctor:

The below listed restorations were inserted during an authorized Bureau of Medicine and Surgery Research Project.

It is requested that the restorations be examined in _____, or at a later date and that the restorations be evaluated as "Satisfactory" or "Unsatisfactory". In the event the tooth or teeth have been extracted, record this finding in the "Remark" column along with any other comments you care to make.

After you have completed your evaluation, fold this form in thirds (along the dotted lines), staple, and mail to the Dental Research Facility, Great Lakes, Illinois.

William E. Ludwick
WILLIAM E. LUDWICK
CAPTAIN, DC, USN

Name of Patient _____
Code No. of Dental Officer _____

Tooth Number	Restoration	Satisfactory	Unsatisfactory	Remarks
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

(over)

Tooth Number	Restoration	Satisfactory	Unsatisfactory	Remarks
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				

Name _____
Address _____

_____

Official Business

Postage and Fees Paid
Navy Department

Dental Research Facility
Dental Department, Building 600
U.S. Naval Training Center
Great Lakes, Illinois 60088

APPENDIX C

INVITED CONSULTANTS AND ORGANIZATIONS THEY REPRESENTED

John C. Brauer, DDS, Consultant
Civilian Health and Medical Advisory Council
Assistant Secretary of Defense (Manpower)
Department of Defense

H. B. G. Robinson, DDS, Consultant
Bureau of Medicine and Surgery
Department of the Navy

Raymond J. Nagle, DMD, Chairman
Council on Dental Education
American Dental Association

Robert L. Kreiner, DDS, Chairman
Council on Dental Research
American Dental Association

David W. Matteson, DDS, Chairman
Council on Federal Dental Services
American Dental Association

Robert A. Hundley, DDS, President
Illinois State Dental Society

R. I. Humphrey, DDS, Secretary
Illinois State Board of Dental Examiners

John M. Spence, DDS, Chairman
Department of Operative Dentistry
University of Illinois

Paul T. Dawson, DDS, Chairman
Department of Operative Dentistry
Loyola University

Matt A. Holzhauer, DDS, Chairman
Department of Operative Dentistry
Marquette University

Arne F. Romnes, DDS, Chairman
Department of Operative Dentistry
Northwestern University

APPENDIX D

CONSULTANT'S COMMENTS

When the consultants were invited to visit Great Lakes, several were openly opposed to the study even though experimental studies concerned with expanding the duties of dental hygienists and assistants had been recommended by the American Dental Association. They were prevailed upon to come and see the study for themselves and then to express their opinions. It must be pointed out that participating as a consultant does not imply endorsement of this study. Since some were in favor of the experimental programs and others were not, the combined opinions of the consultants provides valuable information for the assessment of this study.

All the consultants were asked to make verbal comments about the study after the evaluations had been completed. One expressed the opinion that the quality of the treatment was above average for both the research teams and the control groups but it might not be acceptable for a state board examination. In view of the large amount of treatment the recruits need when they enter the military service, he thought the quality should be defined, which would be acceptable for military needs. He also indicated that some of the completed restorations were as fine as that expected of the average senior dental student.

Several consultants recommended that all the silicates should be inserted under a rubber dam. Two were of the opinion that some of the cavity preparations should have been extended into more self-cleansing area, however, other consultants were of the opinion that the vast majority had been extended properly.

The consultants also observed that some of the technicians were more capable than others and thought that a small amount of additional training for two of the technicians would make them more efficient and effective.

APPENDIX E

ILLINOIS STATE DENTAL SOCIETY

A Constituent of the American Dental Association

Office of the President
Dr. Robert A. Hundley
3915a Waverly Avenue
East St. Louis, Illinois

July 31, 1963

M. G. Turner, Captain, DC, U. S. Navy
Director, Dental Department
Administrative Command
U. S. Naval Training Center
Great Lakes, Illinois

Dear Captain Turner:

I must first thank you for the courtesies extended me on my visit to your Command. You made my stay very pleasant.

I am sure you will be able to carry this study through to a successful conclusion. If the Dental Technicians are inducted into the program early in their service, so that practical work and not all training can be done, it will be most profitable to the Government.

During the discussion period the School people were most concerned about the cavity preparations. This part would have no bearing on the Dental Technicians share in the program. They can only fill the cavities as offered to them. Never having been a Dental Teacher or a State Board Examiner I was less critical of this area. I don't believe that too many of the restorations I saw were of the classical type that you would prepare to be granted a license to practice. I don't quite see how that requirement would be the one in these cases.

My disturbing feeling, which I seemed to hold alone, was for the future of these trained Dental Technicians. These young people, for perhaps a year and a half, are to be taught a skill and given a training, that is, under the present Dental Act illegal to use in their future non-service life.

Perhaps I am too altruistic but were I one of them I would be tempted to offer that service to a potential purchaser. The reaction I received at the caucus to this, was that the moral fiber of the Dentist

so approached was the one to be challenged. Through the years we have seen the fragmentation of the Profession, by the use of Dental Laboratories, Assistants, Hygienists, division into a multitude of specialties. All of these have suffered some abuses in their use.

Captain Ludwick, whose ethics would be of the highest and unchallengeable, said he was so convinced of the value of the program, he would personally hate to go back to the conventional method. Now, if we transpose him into private practice, should we expect much change in his studied beliefs? This infers no change in his actions. Remember he typifies the highest. Does that degree of High Ethics extend throughout the Licensed Profession? We all wish it were so but our practicality tells us differently.

All of us who have raised families know the problems of having goodies real close which we dare not touch. Lets face it, these trained boys and girls could easily be valuable adjuncts to a practice but would be "untouchable". It worries me, needlessly you say, it still worries me.

In conclusion, and you hope its about time, I know the integrity of the service will carry the program through to a successful conclusion. My only hope is that too much hurt to too many people does not follow in its wake.

Sincerely,

/s/ Robert A. Hundley, D. D. S.

RH:fd

APPENDIX F

Marquette University
School of Dentistry
604 North Sixteenth Street
Milwaukee 3, Wisconsin

August 2, 1963

Captain M.G. Turner USN
U.S.N.T.C.
Dental Department, Building 600
Great Lakes, Illinois

Dear Sir:

It was like "old home week" for me on Monday 29 of July. I really enjoyed every minute of my visit with you. A sincere "thank you" to all the officers. Wonderful hosts.

Just a few comments on the evaluation of Captain Ludwick's technician program. I was amazed at the proficiency and capability of your staff. Some of the comments at the end of the program I felt were really uncalled for. We were asked to evaluate the technician program and not to criticize the technical skill of the officers.

Only two phases of the program seemed a little out of line to me. I hesitate about the placing of cement bases. This requires more than just technical skill. Proper protection needs more basic science knowledge than just the skill of adaptation. The operator must know the principles underlying the procedure much better than the procedure itself.

I also feel that the program seems to leave one with the impression that the dentist is working on a "production line" basis, lowering his professional status. "A dentist is not a machine nor a factory worker and his product is not a car". Dr. Maury Massler of the University of Illinois made this statement in his Teaching and Learning Manual.

Please accept this as constructive criticism meant only to portray my impressions. I'm sure your program will eventually be accepted in its most part. Thank you again.

Sincerely yours,

/s/ Matt A. Holzhauer, D.D.S.
Chairman
Department of Operative Dentistry

MAH:az

APPENDIX G

Greater Utilization of Dental Technicians*
Great Lakes Navy Training Center
Comments Regarding Visitation July 29, 1963
John C. Brauer, D.D.S., Consultant**

1. Objectives of Experimental Program. While the following listed items do not represent all of the objectives, these three are deemed of primary importance by this consultant.

A. To evaluate the effectiveness of the utilization of dental technicians (dental assistants), who have had the routine Navy basic training for dental technicians, and who have had additional instruction and training in the performance of operative procedures (i.e., amalgam alloy and silicate cement restorations involving some 210 hours).

B. To evaluate the effectiveness of utilization of technicians cited in A above, involving a dental officer with one to four dental assistants and one to four dental operating areas (chairs, units, etc.).

C. To evaluate quantitatively and qualitatively the dental service potential with reference to items A and B above.

2. Evaluation by Consultants of Restorations Previously Completed by Dental Officers and Dental Technicians.

A. Consultants Examine Patients. Seven consultants examined some 45 patients, each in a private office, wherein the examination was limited to the teeth restored in this experiment, and wherein some teeth had been restored*** by dental officers and some by technicians. This was a double blind evaluation procedure, wherein the consultants did not know who (technician or officer) had restored the teeth. The consultant examined the teeth and restorations and reported the findings (satisfactory or unsatisfactory) to a recorder.

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*Experimental program directed by Captain William E. Ludwick, DC, U.S. Navy (Principal Investigator), and Collaborators, namely: Commander Eldon O. Schnoebelen, DC, U.S. Navy, and Lt. Commander David J. Knoedler, DC, U.S. Navy.

**The comments presented here represent the opinion of this consultant only.

***The word restored in this instance refers to the placement of matrix band--when appropriate, condensation of alloy or placement of silicate cement, and carving to anatomical form. The cavity preparation had in all instances been completed by a dental officer.

A restoration (amalgam or silicate cement) was judged to be satisfactory if the consultant deemed the margins, tooth anatomy, and occlusion acceptable in accordance with his (consultant's) minimum standards. Since each restoration had been inspected previously by a dental officer prior to the dismissal of the patient for the particular appointment, it had been given the appropriate professional approval.

The consultants included: Dr. Matt A. Holzhauer, Head, Dept. of Operative Dentistry, Marquette University; Dr. Arne F. Romnes, Head, Dept. of Operative Dentistry, Northwestern University; Dr. John M. Spence, Head, Dept. of Operative Dentistry, University of Illinois; Dr. Robert A. Hundley, President, Illinois State Dental Society; Dr. Robert L. Kreiner, Chairman, A. D. A. Council on Dental Research; Dr. Paul T. Dawson, Chairman, Dept. of Operative Dentistry, Loyola University; and Dr. John C. Brauer, Dean, University of North Carolina. Dr. Sholom Pearlman, Secretary, Council on Dental Research, A. D. A., also, was present as an observer.

B. Findings, Observations, and Comments.

(1) Findings. Following the procedure cited in 2A, the percentage of unsatisfactory restorations listed was very small, perhaps less than 5 per cent, when one patient with 5 unsatisfactory silicate cement fillings was eliminated.

In the final evaluation, it was determined by the research group (dental officers) that if four of the seven consultants present evaluated a particular restoration unsatisfactory, it would be classified as unsatisfactory. However, if four evaluated a restoration satisfactory, and three voted unsatisfactory, it would be classified as satisfactory. In other words, a majority vote determined the status of the restoration. Cavity preparation, accomplished by the dental officer, was not a consideration in the determination of a satisfactory restoration in this evaluation procedure.

(2) Observations.

(a) There was a great variation of opinion among the seven consultants as to their evaluation and determination of a satisfactory and unsatisfactory restoration.

(b) In the sample of restorations seen in the patients examined, a high percentage (number not known) were class one occlusal fillings, and, in many instances, small occlusal, lingual (upper lateral incisor), or buccal pit fillings.

Accordingly, if quantity of restorations is being evaluated, in this sample, the data would be biased strongly in favor of small, easily prepared and filled, restorations.

(c) The rubber dam was not employed in cavity preparations or restorations for either the amalgam or silicate cement restorations.

(d) The philosophy, with reference to both the cavity preparation and the restoration, related to the need in the Training Center (involving large number of recruits--approximately 50,000 annually at this station--with multiple dental needs) to accomplish the most dental service for the greatest number of military personnel, consistent with the dental officers' concept and rationalization of "satisfactory service".

The question of standards of dental service, i.e., cavity preparation and restoration, therefore, becomes extremely important in an evaluation of this or other comparable programs. The relative degree of efficiency, economy, or productiveness, as it applies to the effective utilization of any number of dental assistants and any number of dental operatories, cannot be determined until the standards of service are more clearly identified and defined. There certainly would be a considerable variation in productiveness (quantity of service) if a comparable experiment was designed and completed in any school of dentistry, wherein members of the faculty would perform the cavity preparations, and, then, supervise the restoration procedures accomplished by trained dental assistants.

(e) Some of the MO and MOD amalgam restorations accomplished by technicians, following cavity preparations completed by the dental officers, were as fine as that expected of the average senior student in dental school. This consultant observed the application of the matrix, the condensation of amalgam alloy, and the carving of a number of restorations by the technicians involving two or more surfaces, and a significant percentage of the completed restorations were equal in quality to that expected of the average senior dental student. Some restorations, however, were approved as satisfactory by the dental officers which would not meet the minimum acceptable standards in any dental school (refer here to comments made regarding philosophy--see 2B (2) (d)).

The latter procedures were observed prior to the evaluation of restorations referred to in 2A and B above.

3. Conclusions.

A. Dental technicians (assistants), if selected and screened as related to aptitudes, if trained as outlined by the U. S. Naval Training Center, Great Lakes, Illinois, and if limited to the procedures as identified in this experiment, can perform at a level of competence equal to the average dental student with comparable clinical experience.

B. If the experimental program at the Great Lakes Naval Training Center is to be equated with any other experimental program with comparable objectives, and if the relative productiveness is to be identified quantitatively, to determine the effectiveness in the utilization of one or more dental technicians (assistants) and one or more dental chairs (operatories), then, more definitive standards of operative procedure must be identified.

C. Considering all of the comments in 2e above, the average restoration was at least equal, and perhaps better in quality, to that now produced in the average civilian dental office in the United States.

D. The Navy Dental Corps, and the dental officers responsible and associated with this experimental program, must be complimented highly for their initiative, and experimental design of the entire project and the leadership expressed in extending the frontiers of knowledge in this all important area of dental manpower and professional service. The Navy Dental Corps, through this experimental program, is honoring the request of the House of Delegates of the American Dental Association, wherein this policy forming body continues to urge the schools of dentistry, the Federal Services, and the Armed Forces Dental Corps, to conduct experimentation consistent with this project. The preliminary data already available represents a valuable contribution to the American and World Dentistry, and continuation of experimentation

is warranted to include areas other than operative dentistry, consistent with the action of the American Dental Association House of Delegates.

cc: Dr. Shirley C. Fisk, M.D., Deputy Assistant Secretary (Health and Medical)
Frank M. Kyes, Rear Admiral, DC, USN
W.E. Ludwick, Capt., DC, USN
C.W. Schantz, Rear Admiral, DC, USN
Mr. Reginald Sullens, Sect., A.A.D.S.
Dr. Kenneth Wessels, Sect., Council on Dental Education

APPENDIX H

The University of Kansas City
School of Dentistry
1108 East Tenth Street
Kansas City 6, Missouri

August 13, 1963

Rear Admiral E. C. Kenney
Surgeon General
Department of the Navy
Bureau of Medicine and Surgery
Washington 25, D. C.

Dear Admiral Kenney:

On Monday, August 12, it was my pleasure to visit the dental facility of the United States Naval Training Center at Great Lakes as your representative.

After a tour of the dental research facility, which I had not visited in over ten years, Dr. Russell Brown (representing the American Dental Association) and I were briefed by Captain Turner and Captain Ludwick on the project to study the greater utilization of dental technicians. We then went to the clinic and observed the dentist-technician teams in action until their duty day terminated. A group of approximately forty patients treated by the dentist-technician teams or by dentists were examined in a double blind test. Although this was a limited group, we found no significant difference between the restorations placed by dentists or dentist-technician teams when scored on a satisfactory or unsatisfactory basis. We were well impressed with the quality of dental service produced by the dentist-technician teams.

While preliminary study indicates that a dentist technician team (one dentist - four technicians) produces three to four times the amount of dental treatment produced by one dentist with one technician, further evaluation is indicated. The following questions are yet unanswered:

(1) Will the dentist-technician teams continue to become increasingly productive without reducing quality of therapy?

(2) What is the optimum ratio of dentists to technicians? (To date four technicians and three chairs per dentist is indicated as better than five technicians and four chairs).

(3) What are the economics involved? (How much will it cost to

maintain four technicians, three chairs and one dentist in comparison with one technician, two chairs and one dentist? How do training costs per technician compare with training costs per dentist assuming that a dentist may be expected to serve twenty years and was educated at his own expense and a technician may be expected to serve less than four years and was trained at Navy expense?)

It was a worthwhile visit to the facility. The officers in command and the officers and enlisted personnel active in the program are to be congratulated. I would strongly recommend the continued support of this project and consideration of its expansion. I also wish to take this opportunity to commend the research activities at the Great Lakes Naval Training Center.

Sincerely,

/s/ Hamilton B.G. Robinson, Dean

HR:ab

cc: Rear Admiral F.M. Kyes
Captain M.G. Turner

Reproduced with the permission of Dean Hamilton B.G. Robinson

APPENDIX I

Report of Consultant Visit to the Dental Research Facility, Great Lakes, Illinois - August 12, 1963

"Greater Utilization of Dental Technicians"

In 1959 one of the investigators, Captain William E. Ludwick, D. C., U. S. Navy, initiated an exploratory study which expanded the duties of dental technicians (assistants). The results of this study appeared promising. After the House of Delegates of the American Dental Association issued its Statement of Policy regarding Experimentation in Training and Utilization of Dental Hygienists and Dental Assistants in October 1961 and the amendment in October 1962, the Bureau of Medicine and Surgery in 1962 authorized the Dental Research Facility at Great Lakes, Illinois to expand the duties of 12 technicians (assistants) for a one year research study.

Preliminary to the actual study of dental technicians completed the 16-week General Course for Dental Technicians and a 7-week training course, specifically in preparation for the study. In the 7-week course the technicians were given training in the following procedures:

1. Rubber dam technique.
2. Matrix technique.
3. Amalgam condensation utilizing hand instruments.
4. Carving amalgam restorations to preliminary contour and occlusion.
5. Placement of silicate restorations.
6. Placement of base and liner materials.
7. Placement of temporary restorative materials.
8. Finishing and polishing.
9. Clinical experience.

Experimental design:

The experimental design appears to be sound.

1. The dentists were rotated between various experimental situations to equalize individual variability.
2. Patients were chosen on basis of limited amount of treatment needed. Gross rampant caries cases were excluded, and patients with eight or less carious teeth were included in the study.

3. In actual practice the treatment by the assistant appeared to be confined to:

   a. Placing matrix and wedging.
   b. Placing amalgam.
   c. Placing silicate.
   d. Placing cement bases.
   e. Carving restorations.

4. There is some question as to the adequacy of the step-by-step supervision in placing and wedging of the matrix, placement of the cement bases and etc.

5. The design of the experiment allows for adequate "follow up" on patients.

NEXT PHASE OF PROGRAM

The next phase of the program is to carry on the preferred system of 1 (one) dental officer and 4 technicians, using 3 dental chairs for an additional period of 12 weeks.

OVERALL IMPRESSIONS OF THE STUDY

1. The quality of the restorations compared with those done by the average dentist.

The amalgam restorations were well done. There were a small number of silicate restorations in the study and four or five of these appeared to be unsatisfactory.

2. The methods of operating appeared to be satisfactory, at least for the armed services.

3. There was a significant increase in productivity. (The Navy is very interested in production and this program definitely increases production).

4. Apparently there is adequate professional supervision.

5. There is some question as to the applicability of this system of operation to a private office situation. The average private practice is not an assembly line production of amalgam and silicate restorations.

6. The question does not involve "whether an assistant <u>can</u> be taught to perform certain duties".

Reproduced with the permission of Russell V. Brown, D.D.S., M.S.
A copy of this report was presented to the Council on Federal Dental Services.

APPENDIX J

Dental Research Facility No
Dental Department
Naval Administrative Command
U. S. Naval Training Center
Great Lakes, Illinois

Dear Doctor:

The below listed restorations were inserted during an authorized Bureau of Medicine and Surgery Research Project.

It is requested that the restorations be examined in _____ or at a later date and that the restorations be rated as unsatisfactory, fair, good or excellent. In the event the tooth or teeth have been extracted, record this finding in the Remark column along with any other comments you care to make.

After you have completed your evaluation, fold this form in thirds (along the dotted lines), staple, and mail to the Dental Research Facility, Great Lakes, Illinois.

William E. Ludwick
WILLIAM E. LUDWICK
CAPTAIN, DC, USN

Name of Patient _____
Code No. of Dental Officer _____

Tooth No.	Restoration	Unsatis-factory	Fair	Good	Excellent	Remarks
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						

(over)

Tooth No.	Restoration	Unsatis-factory	Fair	Good	Excellent	Remarks
17						
18						
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