AN OVERVIEW OF DENTAL ASSISTANT UTILISATION (DAU) AND RECOMMENDATIONS FOR THE ESTABLISHMENT OF AN UNDERGRADUATE DAU PROGRAMME IN AUSTRALIA

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SUMMARY

At the present time in Australia (1992) there exists no undergraduate training for dental students in auxiliary utilisation. The result of this is that new dental graduates have no understanding of the concept of practising sit-down four-handed dentistry in a comfortable and efficient manner. This compares with the United States of America (USA) where, since 1961, every dental student receives formal instruction in Dental Assistant Utilisation (DAU) and, since 1973, Training in Expanded Auxiliary Management.

In this treatise the history and development of "four-handed dentistry" is presented along with a literature review of the fundamental principles of DAU. The initial pilot programmes and the subsequent federally funded national DAU programme in the USA are analysed. Four undergraduate DAU programmes from the USA and the current graduate continuing education DAU programme at Westmead Hospital Dental Clinical School are examined. Finally, guidelines for the establishment and operation of a DAU programme are outlined.

The aim of this treatise therefore, is to provide the necessary information for a thorough understanding of the fundamentals and philosophy of Dental Assistant Utilisation. This information is presented in the hope that at some stage in the future training in assistant utilisation would become an integral and important part of the undergraduate dental curriculum in Australia. The purpose of this would be to fill a major void that currently exists in the undergraduate training of dental students in auxiliary utilisation.
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DEDICATION

To my Mother and Father,
without whose completely unselfish
love and support
I would not be where I am today.
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CHAPTER 1

INTRODUCTION

The purpose of this treatise is to provide the necessary information to the reader for understanding the fundamentals and philosophy of a successful Dental Assistant Utilisation (DAU) programme. The ultimate goal of the writer would be to see this paper used as a basis for the establishment of an undergraduate DAU training programme in Australia.

Training in DAU in Australia up to the present time has been exceptionally limited. There exists no formal undergraduate instruction in the principles of auxiliary utilisation or practice management. Most graduating dentists are influenced very much by the first practice and practice principal that they encounter when they enter private practice.

The only formal DAU programme that has existed in Australia is the one that has existed at Westmead Hospital Dental Clinical School (WHDCS), in New South Wales, since 1982. This programme trains first year dental graduates employed at the Dental School as staff dentists (approximately 12 a year) and private practitioners via a continuing education course (at a rate of 12 dentist-assistant teams a year).

Later in the introduction the history and development of "four-handed dentistry" in the United States of America (USA) from 1957 to 1973 is discussed by looking at the concept of DAU, defining what four-handed dentistry is and examining the reasons for wanting to practise dentistry this way.

This treatise represents a complete review of the English literature pertaining to the fundamental principles of DAU as they relate to general conservative clinical
dentistry. These principles presented in Chapter 2 represent the cornerstone upon which any DAU programme would be built.

Chapter 3 reviews the development of DAU programmes in the United States of America. The pilot programmes as well as the ensuing national programme are analysed on a broad level. Teaching methodologies and results of the pilots are presented. Objectives, guidelines and a review of the national programme are outlined.

The DAU programmes at the University of Missouri - Kansas City (commencing in 1957), the University of Kentucky (1963), the University of Texas - San Antonio (1973) and the University of Colorado (1976) are discussed in Chapter 4.

Chapters 3 and 4 provide a thorough understanding of the DAU experience (at an undergraduate level) in the United States primarily between 1957 and 1973 when federal funding ceased. In this final year some $US4,000,000 was allocated to undergraduate DAU programmes by the Federal Government.

Chapter 5 reviews the DAU programme at Westmead Hospital Dental Clinical School. This programme is directed at a graduate continuing education level and provides a good contrast with the experiences of undergraduate DAU programmes in the United States.

Finally, a list of minimum requirements are detailed (Chapter 6) by the writer which he considers essential for the satisfactory operation of a DAU programme. These requirements are based on a review of the literature, a comparison of the various DAU programmes previously mentioned and on the writer’s eight years experience as a Resident Dental Officer and then Registrar in the Dental Assistant Utilisation Unit at Westmead Hospital from 1985 to 1992.
History and Development of DAU

In 1841 in the United States, Alabama led the nation in enacting legislation which aimed to ensure the public received competent treatment from qualified dental practitioners. Dental Practice Acts have since been enacted to regulate and control dentistry.

The first reported use of an assistant in the literature was by a Dr Edmund Kells of New Orleans in 1887. In an 1893 article in The Dental Cosmos, Kells discussed how to increase and improve a dental practice (Anonymous, 1971c).

In 1902 Dr M.L. Rheim formally proposed that additional personnel in a dental practice be trained and licensed to perform oral prophylaxis (Ponce and Goldthorpe). This would free the dentist for other dental services, thus increasing productivity. In 1916 the first dental hygiene school was established.

In 1924 the American Dental Assistants Association was founded and training programmes were developed. Prior to this, training was almost exclusively "on the job". Formal education and subsequent certification mechanisms became available for hygienists and dental assistants. The extent of their contribution to dentistry is regulated by each state’s Dental Practice Act.

At the turn of the century and with the development and application of the motion picture camera, time and motion studies were being used in industry. Time and motion studies are the systematic investigation and analysis of the motions and time required to complete a task and to seek more efficient methods of production (as well as setting time standards). Some 25 years later these studies were applied to the practice of dentistry (Mundel, 1958).
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During the Second World War, ergonomics (the study of man’s relationship to the work environment) became prominent in resolving the problems of production for the war effort. Likewise, these principles were eventually applied to the practice of dentistry.

It had been long recognised by then that dentists were operating, at most times, under great stress. Most clinical procedures were being performed with the patient sitting upright and dentists standing on their feet all day. A sore neck and an aching back were unavoidable ailments for most and it was not surprising that over 50 per cent of deaths among dentists were directly attributable to circulatory diseases (Sharma and Kuster, 1974a). It was evident that the productivity of a dentist could only be effectively increased if strain and fatigue were minimised. By providing the dentist with a better working environment and by providing improved and faster means of performing dental procedures this could be achieved.

With the innovation of materials and equipment, a radical change in dentistry occurred. The single most significant innovation was the advent of the high-speed handpiece. The speed and ease with which hard tooth structures could be cut, not only increased the amount of work a dentist could do at each appointment, but it also led to the introduction of the concept of four-handed sit-down dentistry.

The term four-handed dentistry has evolved over the past 30 years and is a concept which derives its name from the fact that the hands of both the operator and the chairside assistant are used to provide dental care.

One of the ramifications of high speed cutting was the necessity of using water spray coolants in order to protect the dental pulp. The heat generated by a high speed bur was so intense that a constant and steady water coolant spray was required to prevent pulpal trauma. This necessitated the development and use of oral evacuation by suction, thus eliminating the need for the patient to sit up and expectorate.
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Once it was realised that the patient need not sit upright and the psychological ties to the spittoon were broken, it was but a short step to the development of modern dental equipment and the concepts of four-handed sit-down dentistry. Lounge-type dental chairs made it possible to place the patient in a comfortable reclined position. This also served to save as much as 15 per cent (Sharma and Kuster, 1974a) to 20 per cent (Anderson, 1961) of the chair time which was previously taken up by the patient rinsing and expectorating at the spittoon. The dentist sat down comfortably and was now able to view all parts of the patient's oral cavity without straining the neck or back muscles. The assistant's role became more defined and beneficial to the dentist.

By 1950, in the United States (US), resource studies were indicating a growing disparity between the demands for dental care and the ability of dentists to meet those demands. Professional leaders, in co-operation with the United States Public Health Service (USPHS), began working toward a two pronged solution: to increase the training capacity of dental schools, and to increase the productivity of the individual dentist so that more patients could be treated.

During the 1950's, the principle of Professional Budget Planning (which had been in use in business for approximately 30 years) came into effect in dentistry (Ponce and Goldthorpe). The plan stressed efficiency in areas such as appointment control, fee development, billing systems, treatment plan presentation, recall systems, bookkeeping, financing and communication. Little, if any, attention was given to the actual physical practice of dentistry with regard to efficiency.

About the same time, the United States Public Health Service recognised a growing dental manpower shortage. In 1957 the American Academy of Dental Practice Administration held a two day workshop in Chicago to discuss "one of the biggest problems confronting dentistry now and in the foreseeable future, ... the necessity of providing more dental care for more people" (Ponce and Goldthorpe).
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In 1956 the USPHS established experimental pilot programmes at six dental schools in Dental Assistant Utilisation. The results of those pilot programmes proved very encouraging and showed them to be developing the desired behaviour attitudes in students in relation to auxiliary utilisation (Kazis, 1972). In addition the pilot programmes seemed to be practical in that they were instituted without too much disruption to the existing courses of undergraduate instruction. Therefore grant money was provided by Congress and the new Dental Assistant Utilisation Programme was established in 1961 to assist all dental schools in undertaking DAU programmes (Anonymous, 1968b).

The DAU programme was sponsored and funded by a grant from the USPHS and administered by the Bureau of Health Manpower, Division of Dental Health. The effect of the National DAU Programme was to assist dental schools in developing a formal continuing programme of classroom and clinical instruction in the practical methodology of team dentistry. The more extensive and intensive utilisation of trained, competent dental assistants was one of the basic component parts of the DAU programme. The purpose, therefore, of the Dental Assistant Utilisation programme was to prepare future dentists to increase their productivity and quality by participating effectively as an integral part of a team.

Begun in the 1950’s and gaining popularity in the 1960’s Kilpatrick’s concept of work simplification in dental practice tied together many of the areas of industrial management to dental practice. Work simplification may be defined as the science devoted to dealing with the problem of how to accomplish the necessary work (or task) in the shortest time with reduced stress and increased efficiency. It is a combination of time motion studies and creative thinking. Economy of motion, office design, instrument delivery, standardisation of procedures and personnel utilisation constitute some of its major areas.
Introduction

Between 1960 and 1976 the number of US dental schools rose from 47 to 59, resulting in an increase of dental school graduates from 3,253 in 1960 to 4,969 in 1975, a growth of 53 per cent (Douglas and Cole, 1979). The number of practising dentists for every 100,000 population in the United States dropped from 58 in 1920 to 45 in 1965, a decrease of 22 per cent (American Dental Association, Bureau of Economic Research and Statistics, 1965). In 1976 there were on average 52 dentists per 100,000 population (American Dental Association, Bureau of Economic Research and Statistics, 1976).

While the dentist to population ratio has become more favourable, some changes have occurred in the "busyness" of private dental practices. From 1964 to 1972 the average number of hours worked by dentists decreased from 43.2 to 41.0, but the average number of patient visits increased from 3,343 to 3,692 (American Dental Association, Bureau of Economic Research and Statistics, 1974).

The success of the DAU programme is further evident in 1975 data which showed that 92.5 per cent of independent dentists employed at least one assistant, either part or full-time (American Dental Association, Bureau of Economic Research and Statistics, 1976). In response to this demand for assistants, the number of institutions offering dental assisting training programmes grew from 26 with 658 graduates in 1962 to 250 with over 6,000 graduates in 1976. This trend has increased the number of active assistants per 100 active dentists from 70 in 1950 to 120 in 1975 (Douglass and Cole, 1979).

The USPHS provided the greatest impetus for increasing the efficient use of assistants through the development of the National Dental Assistant Utilisation Programme in 1961 which was designed to train dentists how to use the services of an assistant. Federal financial support was provided to dental schools, where students were introduced to "four-handed" dentistry while receiving their clinical training. The other contributing factor to increased productivity was the technological
advances which have occurred since the mid-fifties. Among these improvements in the dentists' instruments were the high-speed handpiece, the panographic X-ray machine, the high-volume suction and improved restorative materials.

Dental Assistant Utilisation programmes have been sponsored at dental schools in the United States by the Education and Facilities Branch, Division of Dental Health, USPHS. The primary purpose of the DAU programmes in dental schools was to provide instruction and experience for dental students in the effective utilisation of dental assistants to improve the productivity of the dental practitioner.

Many clinicians, recognising the need to improve the efficiency of dental practice and to reduce the stress under which the dentist operated, contributed to the development of modern equipment. Elbert Thompson (1955) contributed to the development of high velocity suction equipment, operating stools and techniques for sit-down dentistry. John Anderson (1960) helped develop contour chairs and surgery design. Harold Kilpatrick's "Work Simplification in Dental Practice" has become an accepted text on systems of office organisation and David Hoffman (1957) pointed out that the application of time and motion concepts to the routine practice of dentistry is desirable.

The term "four-handed dentistry" was first recorded in the proceedings of a conference on "Training Dental Students to Use Chairside Assistants" in 1960. This term has since become widely used. It involves the use of a competent, full-time chairside assistant trained to work constantly with the dentist in performing the technical procedures involved in dental practice.

In 1968 Glen E. Robinson summarised the concept of four-handed dentistry:

"Four-handed dentistry implies that the dentist and assistant, working as a team, perform those operations in a manner that has been carefully and deliberately planned.
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Four-handed dentistry implies a careful study of all phases of office management to conserve time and reduce the stress associated with the practice of dentistry.

Four-handed dentistry implies that the dentist will discharge those obligations that only he can legally do and that he will assign all other tasks to auxiliary personnel.

Four-handed dentistry implies the use of the most modern dental equipment which has been carefully selected and arranged for convenient operation."

The performance of four-handed dentistry requires certain basic elements for it to be effective. Selection of equipment and development of techniques should be directed towards achieving maximum operating efficiency. Operating equipment that will facilitate four-handed dentistry should be selected with care and arranged for the convenience of both the assistant and the operator. Regardless of which configuration is selected, the end result should be that both the operator and the assistant can gain access and visibility during any procedure while maintaining comfort throughout the work day.

Pre-planning, combined with an effective appointment system, is a fundamental principle of four-handed dentistry. Certain advance preparations must be made to enable the assistant to prepare adequately for each appointment. Pre-planning helps determine what procedures can be performed by each member of the operating team.

Time is the most valuable commodity in a dental practice. Effective use of time allows the dentist to provide the best care for the most people. Any effort that is made to eliminate the waste of the operator’s time is worthwhile. The disorganisation of treatment areas, poor appointment scheduling, lack of standardised procedures and interruptions to the dentist are common examples of poor time management that should be eliminated.
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Work simplification is the process of finding an easier way to do any task (Chasteen, 1978). Work simplification studies have established four basic processes to facilitate team dentistry. These are rearrangement, elimination, combination and standardisation (Kilpatrick, 1964).

Four-handed dentistry is sit-down dentistry. Correct positioning of the operator, assistant and patient is very important if four hands are to produce good dentistry in an efficient and comfortable manner. If the dentist and assistant are both to sit while they work the patient must be placed in the supine position.

The use of pre-prepared instrument trays enables the necessary instruments and materials to be assembled before the arrival of the patient. They are then brought to the work surface at the appropriate time to enable the procedure to proceed in an efficient manner. This minimises the amount of "down time" between patients. Pre-prepared tray set-ups offer a simplified and efficient means of instrument delivery. The operator always has the desired instruments readily available and the assistant is not confronted with a large number of instruments in drawers or storerooms. A pre-set tray system is essential for a sound infection control protocol.

Comfort and access to the patient’s oral cavity are essentially achieved by placing the patient in a supine position while the operating team sits as close to the patient’s head as possible. However, it would be nearly impossible to treat a patient in a supine position successfully without some way to control the accumulation of saliva, blood, water and debris. The oral evacuation system removes fluids and debris from the oral cavity while the patient remains in the supine position throughout a dental procedure. Control of fluids and debris during such a procedure is mandatory for favourable visibility and for patient comfort and safety.

The movement of instruments and materials to and from the patient’s oral cavity constitutes a great deal of movement by operators who work alone. One of the most
**Introduction**

effective ways of reducing the amount of movement by the operator during a procedure is to develop an efficient instrument transfer method in which the chairside assistant conveys needed items to the hands of the operator near the patient's oral cavity.

Rubber dam isolation is one of the most beneficial adjuncts to four-handed dentistry. In most cases, the rubber dam can be applied within the time that the operating team has to wait for profound anaesthesia. Application of the rubber dam represents a productive use of valuable chairside time. Use of the rubber dam benefits the operating team in many ways that will be discussed in Chapter 2.

The concept of duty delegation is very useful when applied to dentistry as it allows for greater efficiency and productivity. Total duty delegation occurs when the dentist has an assistant perform an entire task such as the taking of radiographs or the pouring up of impressions for study models. This frees the dentist to engage in other activities in which they are uniquely able to perform. Partial duty delegation is the process of having the assistant help the dentist with a given task. Much of what a chairside assistant does through a typical work day falls into this category of partial duty delegation.

The concept of four-handed dentistry that has evolved as a result of studies previously mentioned, as well as experimentation in DAU programmes, has demonstrated that many fringe benefits begin to appear when the operator fully utilises the skills of an extra pair of hands during all treatment procedures. Dentistry practised with a well trained chairside assistant can result in a more relaxed yet more efficient and productive mode of practice. It is these factors that the techniques of four-handed dentistry specifically address.

Historically the practice of dentistry has proved to be extremely stressful. It requires a high degree of technical excellence performed in an extremely confined area - the
oral cavity. Overlying this is the usual stresses generated by the business requirements of any practice.

Industrial studies have shown that any job performed in a seated position expends anywhere from 15 per cent (Downey and Darling, 1971) up to 27 per cent (Golden, 1964) less energy than the same job performed standing. This can mean that an eight hour day sitting consumes as much energy as a six hour day standing (Kilpatrick, 1974). Life insurance statistics reveal that the life expectancy for a sitting dentist is 17 per cent greater than for a standing dentist (Schmid and Stevenson, 1971).

As a direct result of the dental manpower shortage in the United States in the 1950's ways were sought to improve productivity through increased efficiency. The practice of four-handed dentistry provides for this means of increased efficiency.

There have been many studies over the years which have shown that the productivity of the dentist increases due to the use of chairside assistants. The first and most notable of these was carried out by Henry Klein in 1943 and published in the Journal of the American Dental Association in May 1944.

One finding from Klein's study revealed that dentists who employ dental assistants or hygienists spend more time at the chair in a week than do those who work alone. However, the major findings were on the effect of number of chairs and employment of dental assistants or hygienists on the weekly patient load. A dentist working alone with one chair saw, on average, 39 patients a week; with two chairs, 49 patients. Working with an assistant with one chair, this increased to 53 patients a week; with two chairs, 64 patients. If, in addition to one or more assistants, three chairs were used this increased to 69 patients a week.
Expressed in other terms, when the one-chair dentist working alone is taken as the base, the weekly patient load of the two-chair dentist without an assistant is approximately 25 per cent more, that carried by the one-chair dentist with an assistant is 33 per cent more and that of the two-chair dentist with an assistant is 63 per cent higher, while the weekly patient capacity of the three-chair dentist with an assistant is 75 per cent over the base (Figure 1-1).

The other important study on the effect of utilisation of dental assistants was reported in April 1952 by George E. Waterman. The objective of the study, which began in December 1946 in Richmond, Indiana and concluded in December 1951, was to "explore, under practical operating conditions, the possibilities of extending the services of dentists through the effective utilisation of qualified auxiliary personnel."

Waterman in his study reported the following conclusions:

1. More dental care services can be provided through use of a trained assistant because the assistant conserves the dentist's time by performing the numerous tasks incidental to routine dental treatment, which would otherwise be performed by the dentist.

2. Quality of services is also improved because the dentist is under less physical and mental strain, resulting in better concentration, more enjoyment and, therefore, better quality work.

3. Better control of the patient is possible through the influence of an assistant.

4. Less mental and physical strain results since the activities incidental to the service are being shared. The necessary armamentarium is as near as the dentist's hand, meaning the dentist can work from the seated position during the entire treatment procedure and be less fatigued.

5. Provision of more services results in greater income.

6. The resultant increase in the number of patients treated decreases the tooth mortality rate per patient, reduces the incidence of caries through early detection and treatment and creates more time for preventive treatment.
7. The technique of preparing cavities under water is readily accomplished with the help of a chairside assistant. Also, the appointment periods are shorter, resulting in less pain and discomfort to the patient.

The results of the Richmond study showed that the dentist's contribution to the total number of workload activities could be decreased by 50 per cent when working with one assistant and by 75 per cent when working with two assistants (Figure 1-2).
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Figure 1-1  Productivity increases due to chairside assistants
(Data from Klein, 1943)

Figure 1-2  Effect of chairside assistance on dentists workload
(From Waterman, 1952)
Moen and Fitzgerald, in their 1950 survey of the dental profession found that dentists who employed one assistant averaged 37 per cent more patients than those without such employees, while dentists employing two assistants averaged 69 per cent more patients. Similar findings were reported by subsequent USPHS dental health studies conducted in Woonsocket, Rhode Island in 1953 (Law, Johnson and Knutson, 1953) and 1955 (Law et al., 1955) and in Gainesville, Florida in 1964 (Frank, Law and Spitz, 1964).

In 1962 Hammons reported on the "studies of students' use of chairside assistants at the University of Alabama between 1956 and 1959." His findings were:

1. The qualitative and quantitative performance of mediocre and failing students improved appreciably through the use of chairside dental assistants.

2. The utilisation of chairside dental assistants by superior dental students does not influence their qualitative performance appreciably, but their quantitative performance is improved considerably.

3. The superior dental student can, with reduced clinical time through utilising a chairside dental assistant, perform both qualitatively and quantitatively better than superior students using the conventional schedule of clinical time.

The objectives of effectively employing a chairside assistant and of working in a four-handed sit-down situation are twofold: firstly, to permit the dentist-assistant team to deliver the maximum quantity of dental services to the maximum number of people without sacrificing quality; and secondly, to permit the dentist-assistant team to provide those services in a comfortable and "stress free" manner.
CHAPTER 2

BASIC PRINCIPLES OF DAU

2.1 Introduction

The use of dental auxiliaries is now recognised as an essential part of dentistry. It has become increasingly evident that a well trained dental chairside assistant is as important to modern dental practice as is the sophisticated equipment available.

Effective utilisation of an extra pair of hands provided by the trained assistant in a four-handed sit-down dentistry situation is generally accepted as an ideal method of delivering dental services.

In this chapter the fundamental principles of Dental Assistant Utilisation are presented as they relate to general clinical dentistry. These principles represent the foundation of any DAU programme and would be considered minimum requirements for such a programme.

Chasteen (1984) best sums up the philosophy of four-handed dentistry in his textbook, Essentials of Clinical Dental Assisting:

"The performance of four-handed dentistry requires certain basic elements for it to be effective. These elements are a mixture of mechanical, technical and attitudinal factors that must be combined if the concept is to succeed. Four-handed dentistry is a concept of performing dental procedures in a comfortable, stress free and effective manner for both the assistant and the dentist. Four-handed dentistry is not intended to mean "hurry up dentistry". Its purpose is to provide a method of treating patients at a steady pace without
frustrating delays and unnecessary fatigue. The dental assistant is truly an integral part of this concept.

This concept of delivering dental services consists of four basic principles:

1. Operating in a seated position.
2. Employing the skills of trained dental assistants.
3. Organising every component of the practice.
4. Simplifying all tasks to the maximum."
2.2 Equipment

It is quite apparent that methods of improving the approach to dental health care must be sought with a view to increasing the efficiency and productivity of the individual dentist. Through DAU programmes the concept of sit-down, four-handed dentistry has gained wide acclaim as being highly effectual in teaching dentists productivity increasing techniques. In four-handed dentistry the chairside assistant provides the dentist with an extra pair of hands to assist in providing dental treatment. This approach simply makes use of work simplification procedures and modern functional equipment to promote efficiency and to increase productivity. At the same time, stress and physical fatigue, inherently associated with the practice of dentistry, are reduced markedly. Equipment that is selected should be adaptable to the principles of work simplification, ergonomics and favourable working positions for the patient and operating team. Many factors need to be considered when selecting dental equipment. They include the following: cost, maintenance required, service availability, durability, size and aesthetics.

2.2.1 Dental Chair

1. Body support. A contour chair offers the patient maximum comfort when placed in the supine position. Complete support for the patient’s head, body and arms is required and specific attention should be given to ensure that the patient’s feet are not routinely placed above the head.

2. Thin back. This allows a seated operator to assume a comfortable position with the patient low enough so that the patient’s mouth is approximately at elbow level. A thin chair back should be no more than five centimetres thick when measured 15 centimetres from the head of the chair.
3. Narrow back. A narrow back (no more than 20 centimetres when measured 15 centimetres from the head of the chair) permits both operator and assistant to position themselves close to the patient’s head.

4. Low base. A low chair base plus a thin back help the operator position the patient’s oral cavity at elbow height. The base should permit lowering the seat of the patient’s chair to 35 centimetres or less above the floor. When the patient is seated in the upright position, this height places the patient at approximately eye level to the seated operator.

5. Power operation. The chair should have independently power operated functions which are able to be operated by both operator and assistant (dual controls preferable). Foot controls are preferable from an infection control point of view.

6. Rotation. Ideally, the chair should be able to be rotated on its base. This is helpful in radiography and special patient-operator positions.

7. Headrest. The headrest should be adjustable so that the patient’s head position can be altered as needed for any procedure. Tilting-headrests can be useful but in effect increase the thickness of the chair back, therefore altering the viewing distance of the operator.

2.2.2 Operator’s Stool

1. Completely mobile with a broad, stable base. The stool should permit unlimited, free and easy positioning about the patient’s chair. A base with at least four castors within the circumference of the seat provides stability and prevents tipping of the stool.

2. Padded, contoured seat. The seat should be contoured for support, padded for added comfort and shaped to eliminate any pressure on the large blood vessels in the back of the legs.
3. Height adjustable. The stool should have a minimum height of 35 centimetres and a maximum of 53 centimetres. This allows the operator to position the stool so that the thighs are parallel to the floor.

4. Back support. This support should have both vertical and horizontal adjustments so that positive pressure can be applied to the small of the operator’s back.

2.2.3 Assistant’s Stool

1. Completely mobile with a broad, stable base. A broad (preferably weighted) base with at least five castors is essential for stability.

2. Large padded seat. A requirement for comfort and good circulation to the lower extremities.

3. Height adjustable. The stool should be adjustable to at least 68 centimetres high. This is necessary because in most instances the assistant needs to be seated 10 to 15 centimetres higher than the dentist.

4. Adjustable foot ring. As the height of the assistant above that of the dentist varies, it is important that a foot rest (adjustable in height) is available.

5. Body support. The assistant’s posture requires abdominal support rather than the back support needed by the operator. This support is needed on the assistant’s front and left side, when assisting a right-handed dentist, and should be adjustable in both vertical and horizontal directions. The body support should be easily convertible for either right-handed or left-handed assisting positions.

2.2.4 Dental Unit

1. Mobile. The unit must be mobile so as not to interfere with patient or staff traffic patterns.
2. Housing. The unit should house as many of the following instruments as possible: high-speed and low-speed handpieces, air-water syringe, ultrasonic scaler, curing light.

3. Controls. Air pressure, water spray and on-off controls should be conveniently located. All handpieces should be micro-switch controlled and operated by one foot control.

4. Hoses and cords. Cords and hoses should be of adequate length to reach the operating field with minimal pull on the handpieces/instruments. The cords and hoses should be straight rather than coiled.

5. Efficient. Units should minimise reaching or twisting movements when retrieving or returning instruments. They should be easily used by both right-handed and left-handed operators.

2.2.5 Assistant’s Unit

1. Mobile. The unit should be mobile so as not to interfere with desirable traffic patterns.

2. Limited storage space. The unit should provide easily accessible space for a limited supply of materials and support equipment for the chairside assistant.

3. Work surface. By providing a work surface over the assistant’s lap at chairside, all instruments and supplies are conveniently located to the work area.

4. Height. A height of approximately 80 centimetres will place the work surface over the assistant’s lap and at a comfortable height for the sit-down assistant - about five centimetres below elbow level. It is desirable to have an assistant’s unit adjustable in height.

5. Dynamic instruments. The unit should have the facility to house the high-speed and low-speed suction as well as the air-water syringe.
2.2.6 High-Speed Suction

1. Move high volumes of air. The suction system should move 10 cubic feet of air per minute at a negative pressure of five inches of mercury at the tip (Chasteen, 1978; Sharma and Kuster, 1974b).

2. Solids separator. This should provide for separation of solids in the surgery and drain directly into the sewer system. The traps and collection lines should be easy to clean.

3. Suction motor. The motor should be remotely located so that no evacuated air is exhausted into the surgery.

4. Hose and control. The collection hoses in the surgery should be light, flexible but non-collapsible. The evacuator control should have a convenient on-off switch and be easily operated.

2.2.7 Air-Water Syringe

1. Design. The syringe should be simple in construction, light in weight and easily maintained.

2. Use. The syringe should have separate clearly marked buttons for air and water. It should be easy to use with the tip being able to swivel 360 degrees for access to all areas of the oral cavity. The tip should be bent at an angle of approximately 100 degrees.

2.2.8 Dental Light

1. Intensity. The light should deliver at least 1200 foot candles of light intensity, while general room lighting should provide approximately 300 foot candles of light intensity (Hilborn, Campbell and Hall, 1974; Schmid, 1973; Sharma and Kuster, 1974a). A ratio of three or four to one is ideal.
2. Heat. The light should radiate a minimum of heat which must be able to be dissipated in directions away from the operating field.

3. Use. The light should have complete horizontal and vertical adjustment to enable both operator and assistant to position the light correctly. This adjustment should be to within one metre of the patient’s mouth.

2.2.9 Fixed Cabinetry and Sinks

1. Fixed cabinets. Due to the valuable floor space that fixed units and cabinetry can occupy it is advisable to keep these to a minimum. A wall hung cabinet on the assistant’s side, to hold trays, would be acceptable.

2. Sinks. Separate sinks for both operator and assistant are required. They should be at either stand up or sit down height and have controls which are wrist, knee, foot or light activated.

3. Waste. An open waste drop should be located near each sink.
2.3 Motion Economy

Motion economy is a concept that involves conservation of motion resulting in less expenditure of energy. Movements consume time and can produce fatigue. Also, movements that place the dentist or the assistant in a contorted posture for substantial periods of time are unnecessary and harmful over a long period of time. If movement can be reduced throughout a procedure there will be less fatigue and usually a reduction in the time required for the procedure itself. Good instrument transfers, well designed equipment and positioning of the dentist, chairside assistant and patient are all important in the elimination of wasteful movements by the operating team.

2.3.1 Principles of Motion Economy

1. Minimise the number of body movements. Allowing the assistant to insert amalgam into the prepared cavity will obviate the need for many instrument transfers during this phase of the procedure.
2. Reduce the length of movements. In many surgery set-ups the amalgamator is placed on a shelf or cabinet where the assistant must either leave their seat and go to it, or at least reach and twist a long distance to obtain it. By positioning the amalgamator on the assistant’s unit directly in front of the assistant the length of movements can be reduced.
3. Minimise the number of eye fixations.
4. Pre-position instruments and materials whenever possible.
5. Locate instruments and materials as close as possible to the point of use.
6. Work surfaces should be at a height five centimetres below elbow level.
7. Equipment should be designed to permit good posture.
2.3.2 Motion Classification

1. Class I. This involves fingers only movements. The transfer of a "pen-grasp" instrument is a class I movement.

2. Class II. Class II motions involve movements of the fingers and wrist - such as the transfer of a double-handled or "palm-grasp" instrument.

3. Class III. Movement of fingers, wrist and elbow - as in a dentist placing a rubber dam clamp or an assistant picking up an instrument from the work surface.

4. Class IV. Class IV motions involve movement of the entire arm from the shoulder. Examples are a dentist picking up a handpiece from a correctly positioned dentist’s cart or an assistant adjusting the dental light.

5. Class V. Movement of the entire arm and twisting of the body constitutes a Class V movement. For example, the amalgamator positioned behind the assistant would require a reaching and twisting Class V movement.

The basic goal of motion economy in surgery design is to facilitate work patterns that will minimise the number of Class IV and V movements required for any procedure. These movements are the most fatiguing and time consuming. They require refocusing and reaccommodation of the eyes which can result in eye strain and subsequent headache. Dentists can substantially reduce the number of Class IV and V movements through the effective utilisation of a chairside assistant. The use of class I, II and III movements is preferable for both the operator and the assistant because they involve less muscular activity, save time and allow the eyes to remain fixed on the operative field.

Implementation of work simplification and motion economy principles is aimed at guiding the operating team into a comfortable, relaxed method of working that is free of wasted and fatiguing movements.
2.3.3 Zones of Activity

In four-handed dentistry all persons and equipment are positioned according to zones of activity. These zones are related to the patient in the supine position. There are four major zones of activity and they centre around the patient’s head. The patient’s mouth is seen as the centre of a large clock face with the top of the patient’s head at 12 o’clock. These zones are set out in Table 2-1 and Figure 2-1.

Table 2-1 Zones of Activity

<table>
<thead>
<tr>
<th>Zone</th>
<th>Right-handed dentist</th>
<th>Left-handed dentist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dentist’s zone</td>
<td>8 to 12</td>
<td>4 to 12</td>
</tr>
<tr>
<td>Static zone</td>
<td>12 to 2</td>
<td>12 to 10</td>
</tr>
<tr>
<td>Assistant’s zone</td>
<td>2 to 5</td>
<td>10 to 7</td>
</tr>
<tr>
<td>Transfer zone</td>
<td>5 to 8</td>
<td>7 to 4</td>
</tr>
</tbody>
</table>

The zones of activity for a right-handed operating team are:

1. **Operator’s zone.** This is the area of primary activity for the operator. The most common position is 11 o’clock and is referred to as the "home position". Sometimes the 8 o’clock to 9 o’clock area is used by the operator to gain better access to mandibular areas when using direct vision. The dentist’s unit is located in this area.

2. **Static zone.** This is the area between the operator and the assistant. It is close to the point of use and is the area where instruments, supplies and the assistant’s unit are placed.
3. Assistant’s zone. The primary activity area for the assistant, with the home position being three o’clock. This zone allows the assistant access to the static zone and to the transfer zone for delivering instruments and supplies.

4. Transfer zone. This is the zone of greatest activity around the patient and is where instruments and materials are transferred between the dentist and the assistant. Careful utilisation and preservation of the transfer zone will permit the operator to keep their hands and eyes in the field of operation.

2.3.4 Alley of Delivery

This is the area between the outstretched arms of a correctly positioned dentist and assistant (Figure 2-2). All equipment, instruments and supplies are placed in the appropriate areas within the alley of delivery. This eliminates any unnecessary Class V movements by either the dentist or the assistant.
2.4 Work Simplification

Work simplification can be described most simply as an organised effort to find easier ways of doing work. Work simplification techniques have been used in the industrial field for many years and these techniques can be applied to dentistry.

Work simplification does not mean hurried work. It implies a reduction of stress and not necessarily a saving of time. When both patient and operator are relaxed, however, the work becomes easier and often is accomplished in a shorter period of time. Every effort should be made to simplify dental equipment and patient treatment procedures in order to introduce a minimum number of variables and permit the operating team to function most effectively. There are four basic processes used to accomplish work simplification: rearrangement, elimination, combination and standardisation.

2.4.1 Rearrangement

Of most importance is the correct arrangement of equipment, instruments and supplies in the surgery. Where possible these items should be rearranged such that they are located within the Alley of Delivery. This serves to reduce wasted time and motion as a result of unnecessary reaching. Instruments should be arranged on the assistant’s side in order of use to enable a smooth flow and use of instruments during the appointment.

Rearrangement of steps in procedures can result in decreased "dead-time" such as waiting for a base or lining to set. The placement of the matrix band before the liner/base enables the assistant to triturate the amalgam while the liner/base is setting or being cured.
Rearrangement of the appointment book, or more specifically patient scheduling, can lead to better management of emergency patients. Rather than "squeezing" these patients in, set times during the day can be allocated for the treatment of emergency patients. The benefit of this is that patients who have had their appointments scheduled for some time are not disadvantaged.

Treatment plans can be arranged to allow for quadrant dentistry to be carried out where possible, resulting in fewer appointments, fewer injections and more efficient use of chairside time.

2.4.2 Elimination

An evaluation of all equipment, instruments and materials is essential to the smooth running of any practice. Elimination of unnecessary equipment (such as spittoons, fixed cabinetry) and instruments in particular can reduce costs to that practice. A beneficial side effect to this is the surgery becomes less of a storeroom and more of a treatment room.

The routine use of disposable pre-encapsulated materials eliminates dispensing and mixing of these materials during the course of the appointment and is desirable from an infection control point of view. Consumable materials should be predispersed, whenever possible, before the appointment in order to save time during the procedure.

Procedural steps during an appointment should be critically evaluated to effect a smooth, efficient procedure. Burs should be pre-set in handpieces. Extra items such as pin drills and finishing discs should be pre-determined and placed on the assistant’s work surface so that at the appropriate time these can be placed into the handpiece without the operator having to break away from the mouth.
2.4.3 Combination

The classic example of combination was the advent of the three-way or "triplex" syringe. One syringe provides three separate functions - air alone, water alone and a combination air-water spray. Previously there were separate syringes for air and for water.

Combining the uses of instruments can reduce the number of instruments that need be purchased and placed on to the work surface. A small spoon excavator may be used to place a lining or an amalgam packer may be used to burnish a matrix band or place a base. The use of double-ended instruments also reduces the number of instruments required as does the recent introduction of instrument shanks which may have interchangeable working ends placed into them.

2.4.4 Standardisation

Chasteen (1984) wrote "standardisation involves minimising the number of variables in every aspect of the practice. It is a streamlining process geared to promote predictable routines in the work pattern."

To promote this streamlining process equipment, instruments and supplies need be standardised. Standardising the steps of any given procedure enables the assistant to accurately anticipate the requirements of the operator and ensure a smooth, efficient flow during an appointment.

Accounting, charting, recall and inventory systems should be standardised whenever possible to avoid confusion, delays and time loss.
2.5 Positioning

As the philosophy of Dental Assistant Utilisation necessarily implies a reduction in stress and fatigue, correct positioning of the patient and the operating team probably represents one of the most important requirements for the successful practice of four-handed dentistry.

Simply sitting down to perform dentistry is insufficient to satisfy the requirements of "stress-free" dentistry. The way in which the patient is positioned will have a large bearing on how the operating team sits. If the patient is incorrectly positioned then no amount of adjustment by either member of the team will ensure satisfactory posture. Therefore it is imperative to fully satisfy the criteria for patient positioning before the operator and assistant attempt to take their respective positions at chairside.

Once the patient has been satisfactorily positioned the dental team can take their positions to facilitate good access and visibility to the operative site. There will be times when one member of the team, usually the dentist, is unable to maintain a relaxed, balanced posture. Occasional periods of "incorrect" positioning are not harmful, but it should be stressed that these periods be kept to an absolute minimum.

"A favourable seated position should provide access to the operative field, good visibility, comfort for the operating team and relative comfort and safety for the patient" (Chasteen, 1978).
2.5.1 Positioning the Patient

Ergonomics is adjusting the work environment to suit the operating team. The position of the patient whenever possible must facilitate the correct positioning of the dental team. There will be exceptions to this generalisation such as patients with back problems or women in the third trimester of pregnancy.

Modern dental chairs are contoured for patient comfort and have features that allow the patient to be treated in the supine position. At the same time they allow for patient positioning consistent with the requirements for a relaxed, balanced posture by both dentist and assistant.

The supine position is the preferred position for most treatment procedures. The patient’s legs and head should be positioned at approximately the same level. For maximum comfort for the operating team the end of the patient’s head should be even with the end of the headrest. A patient seated several inches from the end of the chair will mean a vertical lean of three to four times this distance for the operator at eye level. Similarly, the patient’s midline, whenever possible, should coincide with the midline of the chair. A bias of several inches to either side will mean an exaggerated lateral lean for either the assistant or the operator at eye level.

Additional adjustments can be made dependent upon the location and type of treatment procedure. Tilt and rotate the patient’s head until the tooth being treated is in the midline of the operator. It may also be necessary to adjust the inclination of the back of the dental chair.
The following is a suggested technique for placing a patient in the supine position:

1. Place the chair in the upright position.
2. Raise the chair to a height at which the patient can be comfortably seated (not so high that the patient has to "climb" into the chair or so low that the patient "falls" into the chair).
3. Reposition the armrest to facilitate easier entry.
4. Once the patient is seated, inform them prior to all movements when placing them in the supine position.
5. Raise the chair approximately 25 to 30 centimetres. This allows room for the dentist to slide under the chair back when it is finally positioned.
6. Lower the back of the chair until the patient is about halfway toward the horizontal position. Pause a few moments to allow the patient to adjust to this position.
7. Continue lowering the chair back until an imaginary line drawn from the patient’s chin to the top of the patient’s ankles is parallel with the floor.
8. Position the patient such that their head is even with the end of the chair and that their midline is in the midline of the chair.
9. Once the operator is positioned, final adjustments are made to the chair:
   a) Maxillary arch (Figure 2-3a). Chair back parallel to the floor; headrest may be tilted back slightly to raise the patient’s chin.
   b) Mandibular arch (Figure 2-3b). Patient’s head at approximately a 25 degree angle to the floor. This can be achieved by raising the chair back slightly, tilting the headrest up or a combination of both.
2.5.2 Positioning the Dental Operator

As previously discussed the patient should be positioned in accordance with the requirements of the operator. As a result of these requirements the final positioning of the patient and assistant won’t be established until the operator’s position has been determined.

The desired position for an operator is one of relaxed, balanced posture and is achieved by observing the following criteria (Figure 2-4):

1. The height of the operator’s stool should be such that the top of the dentist’s thighs are parallel to the floor when the dentist’s feet are flat on the floor. This maintains adequate circulation to the lower extremities. Ideally, the stool should have a contoured edge on the seat to help avoid compression of blood vessels in the back of the legs.

2. The operator should sit with hips back as far as possible on the seat using the entire surface to support the operator’s weight. This reduces pressure on the back of the thighs and permits the back support of the stool to make positive contact with the lower back.

3. The backrest should support the lower back of the operator. It should not interfere with movement of the arms while allowing the operator to keep the elbows close to the body.

4. The patient should be positioned so that the operator’s wrists are slightly above the level of the forearms which are almost parallel to the floor. This helps reduce muscle pull in the arms and shoulders.

5. The operator’s back and neck should be reasonably upright, with the top of the shoulders parallel to the floor. The tendency of dentists to lean forward while operating increases muscle fatigue in the back and compresses internal organs.
6. A viewing distance of approximately 30 to 40 centimetres between the dentist and the patient’s mouth should be maintained. Leaning forward reduces this distance and tends to block light from entering the operating field.
2.5.3 Positioning the Dental Assistant

The dental assistant is normally positioned after the operator and the patient and must be positioned close enough to be able to see into the oral cavity. The assistant must also be close enough to facilitate the exchange of instruments and materials with the operator.

The following criteria are guidelines for positioning of the dental assistant (Figure 2-5):

1. The assistant’s working zone is from two o’clock to five o’clock (when working with a right-handed dentist) with the preferred location at three o’clock.
2. The assistant’s stool should be as close as possible to the dental chair.
3. The assistant’s thighs should be parallel to the back of the dental chair when the patient is supine.
4. The assistant’s knees should be even with the end of the dental chair.
5. The assistant’s eye level should be 10 to 15 centimetres higher than that of the operator. However, on some occasions when working on the upper arch, the assistant’s vision may be improved by lowering the stool so that the assistant’s eye level is the same as the operator’s.
2.6 Pre-Set Trays

A pre-set tray is a well organised group of instruments and supplies needed for a given dental procedure. The use of a tray system minimises the need to store large quantities of instruments and materials in the dental surgery.

The use of pre-prepared trays offers a simplified and efficient means of instrument delivery. The necessary instruments and materials are assembled before the arrival of the patient. This results in a reduction in "down-time" between patients. "Down-time" is that time required to clean up the surgery after a procedure and prepare for the next patient. A tray system eliminates searching through drawers and cabinets for instruments and supplies during the procedure. There is also less chance of leaving out an essential item when the instruments and materials for a procedure are handled as a group on a tray.

A tray system helps to maintain an accurate inventory of instruments as these are handled as a group rather than individually. Groups or sets of instruments can then be accounted for. Missing or broken instruments can be more readily identified. It also enables less skilled individuals to perform such duties as scrubbing and sterilising instruments. Assembling the trays in a central location prior to their use in the surgery maximises the time available for patient treatment.

A pre-set tray permits an organised approach to each appointment. It is quite obvious if there are any missing instruments or supplies. Trays should be arranged in vertical orientation in front of the assistant, at chairside. The instruments are arranged from bottom to top in the order of use as established by the dental team for each procedure. This enables the assistant to pass and receive instruments in an efficient and safe manner.
2.6.1 Establishing a Tray System

2.6.1.1 Identify procedures most frequently done

This can be accomplished most easily by a retrospective analysis of the operator's appointment book. The longer the period of review the more accurate will be the results. The different types of procedures and the average number of times these procedures are performed each day is recorded. Trays should only be set up for those procedures that are performed most often. A procedure that is performed only once every six months would not be part of a tray system.

Ideally, there should be enough tray set-ups to serve the instrument requirements for a whole day. If this is impractical then a half-day's supply of trays is a minimum requirement. This means that the sterilisation and setting up procedures can be restricted to the major breaks in the day (lunch break and either the end, preferably, or the start of the working day). Although considerably more instruments are needed for implementing a tray system, the initial cost is more than compensated for by the decrease in "down time" between patients. It also means that individual instruments are handled, sterilised and used less frequently.

2.6.1.2 Identify instruments and supplies required for each procedure

In order to maintain the efficiency of the tray system it is important that only those instruments and supplies that will be required for that procedure be placed on the tray. This has the effect of keeping the procedure as simple as possible, particularly for the assistant.

Only instruments that are regularly used (more than 90 per cent of the time) during a procedure should be included on the tray. These are referred to as primary instruments and along with disposable items are included on the tray at the time the
trays are being assembled. This only leaves consumable items (such as anaesthetic cartridges, cavity varnishes, liners and bases, restorative materials and impression materials) to be added to the tray set-up or work surface just prior to the commencement of the procedure. These primary materials should be located in the most accessible and convenient part of the assistant’s cabinet. Secondary instruments and supplies should be located either in the less accessible parts of the assistant’s cabinet or in nearby fixed cabinets for relatively easy retrieval should the need arise.

2.6.1.3 Identify the sequence of each procedure

Defining the sequence of each procedure means that instruments can be organised on the tray to correspond with that sequence. As previously discussed, the tray should be arranged vertically so that the most frequently used items are nearest the assistant with the remaining instruments arranged from bottom to top in the order of their use. This aids the assistant in anticipating the dentist’s needs and rapidly locating an instrument on the tray. An instrument once used should be replaced in its original position to maintain instrument order in case it is needed again.

2.6.1.4 Tray selection

Trays are available in stainless steel, aluminium or plastic. Plastic trays are cheaper than metal, durable, come in an assortment of colours, but must be decontaminated (disinfected) separately from the instruments. Moulded plastic trays are available that provide compartments for materials, holders for burs and a lift for hand instruments.

Metal trays are available as open or covered. Stainless steel trays are usually more expensive than their aluminium or plastic counterparts. The distinct advantage of metal trays over plastic trays is that they are stronger and can be autoclaved or dry heat sterilised rather than just disinfected or decontaminated. Stainless steel trays are unable to be effectively colour coded whereas aluminium trays may be anodised.
These trays usually contain a metal lift for instruments and some provide small compartments for burs and disposable items.

The method of sterilisation used in the practice may influence the choice of tray styles to be used. Complete instrument set-ups in covered metal trays can be sterilised in autoclaves or in dry heat ovens. As discussed earlier plastic trays will require decontamination separately from the instruments.

2.6.1.5 Tray maps

A tray map may be a drawing, photocopy or photograph of the arrangement of the instruments and supplies of the tray set-up for each procedure. The maps are useful in determining if all items on the tray are present and arranged in the correct sequence of use. They are also beneficial to new employees in learning the tray system and help maintain standardisation of the tray system during instrument processing. Another advantage of the tray map is that it can be used as a cover for plastic trays helping to keep the contamination of the tray to a minimum.

2.6.1.6 Instrument lifts or racks

These are devices on the trays to hold the instruments in specific positions on the tray. They may be moulded or fixed to the tray when manufactured or they may be removable pieces made of plastic, rubber or metal. Instrument lifts maintain order on the trays by preventing the instruments from being dislodged. They allow instruments to be grouped together, according to the phase of treatment, for easier identification. Instruments are also elevated from the surface of the tray so that the assistant can pick them up more conveniently.
2.6.1.7 Storage of trays

The trays should be stored in cupboard-style fixed cabinets conveniently located in the surgery (on the assistant's side) or in the sterilisation room. In situations where the surgery and sterilisation room share a common wall a cupboard-style cabinet which opens into both rooms is ideal.

2.6.1.8 Colour coding

Trays can be colour coded either by the manufacturer or by coloured tape. Coloured tape, plastic rings or ceramic handles can be used to colour code instruments. Surgeries can have a predominant colour scheme which can match trays or instruments. Similarly, individual operators or various treatment procedures can have colours assigned to them which match trays or instruments.

Use of colour allows for quick and easy identification of trays, instruments, procedures, surgeries or operators.

"The pre-set tray system is truly an example of work simplification. It is part of the process of standardising the work pattern for common procedures carried out in the dental surgery. In an organisational sense the use of pre-set trays is the act of planning for the usual and not the unusual in everyday practice." (Chasteen, 1978).
2.7 High Speed Suction

The treatment of the patient in the supine position coupled with the employment of high-speed cutting makes the use of some oral evacuation technique essential for the removal of coolant water, saliva and debris from the mouth. This serves to keep the patient comfortable while in the supine position and keeps the operator’s field of vision clear. The removal of water, saliva and debris is achieved by a high-speed vacuum system that creates a suction which removes fluid and debris from the patient’s mouth.

Studies have shown that as much as 15 per cent (Sharma and Kuster, 1974a) to 20 per cent (Anderson, 1961) of chairside time can be taken up by the patient’s sitting up, rinsing, expectorating and repositioning themselves into the supine position. The use of high-speed suction allows for continuous removal of fluids and debris from the patient’s mouth while the patient remains supine. This represents a valuable saving of chairside time, safety for the patient and eliminates the need for a spittoon.

2.7.1 Suction Tips

Metal tips are very durable and autoclavable, but have the disadvantage of being sharp increasing the potential for soft tissue injury. They are also cold due to the air being constantly drawn through the tip. Plastic tips overcome these two problems, but only the heavy gauge tips are autoclavable. If a plastic tip is to be used it should be significantly rigid to act as a retractor for soft tissues while it is being used as an evacuator. Plastic suction tips should be used during electrosurgical procedures as a safeguard against burning the patient should the electrosurge come into contact with a metal suction tip.
A suction tip with two functional ends (an opposite bevel on each end) with a bend in the middle of the tube is widely regarded as a universal tip. The universal suction tip is the one commonly used for most dental procedures. One end (A) is useful only in the anterior segments of the oral cavity while the other end (B) is used in posterior regions (Figure 2-6). The bend enables the tip to be placed without blocking the path of light while the opposite bevels enable access to all areas of the mouth. The tip should have an opening approximately 10 millimetres in diameter and be 15 centimetres in length (Chasteen, 1984; Paul, 1972b).

2.7.2 Holding the Universal Tip

When working with a right-handed dentist the assistant holds the suction tip in the right hand. This leaves the left hand free for using the air-water syringe or for instrument transfers. The suction tip is held in the assistant's left hand when working with a left-handed operator.

There are two popular methods used by the assistant to control the suction tip:

1. Thumb-to-nose grip (Figure 2-7). The tip is held by all four fingers and the palm with the thumb extended backwards along the suction tip towards the assistant's nose ("thumb-to-nose"). This is a firm, positive grip that is required to control the suction tip when firm retraction of soft tissue is required.

2. Modified pen grip (Figure 2-8). The tip is held, as if holding a pen, with the thumb and first two fingers in the long axis of the tip pointing towards the patient's mouth. This grip allows the assistant to hold the tip less rigidly when working in anterior regions of the mouth and in posterior areas when firm soft tissue retraction is not required.
Figure 2-6  The universal suction tip
Figure 2-7  Thumb-to-nose grip

Figure 2-8  Modified pen grip
2.7.3 Guidelines for Suction Tip Placement

Proper placement of the suction tip should allow for removal of both fluids and debris from the oral cavity and provide retraction of soft tissues for better access and visibility. Correct suction tip placement should also provide for patient comfort.

The following criteria will provide for an effective oral evacuation technique:

1. The appropriate end of the suction tip should be selected for the area being treated (i.e., anterior or posterior).

2. The suction tip should be positioned as close as possible or slightly distal to the tooth being treated.

3. The bevel of the suction tip should be placed parallel to the buccal aspect of teeth being prepared on the assistant’s side of the patient’s mouth (Figure 2-9a) and parallel to the lingual aspect of teeth on the operator’s side of the patient (Figure 2-9b).

4. The tip should be placed so that the top edge of the opening is even with the incisal or occlusal surface of the tooth. This allows the tip to catch the water spray from the handpiece after it strikes the tooth being prepared.

5. If an anterior tooth is being prepared from a palatal or lingual approach the bevel of the suction tip should be held parallel with the labial surface of the tooth being prepared (Figure 2-10a).

6. If an anterior tooth is being prepared from a labial or incisal approach the bevel of the suction tip should be held parallel with the palatal or lingual surface of the tooth being prepared (Figure 2-10b).

7. The suction tip should be held with positive control, out of the path of light and, whenever possible, be positioned first to avoid trapping the mouth mirror.
Figure 2-9a  Suction tip positioned buccally (posterior teeth)

Figure 2-9b  Suction tip positioned lingually (posterior teeth)
Figure 2-10a  Suction tip positioned lingually (anterior teeth)

Figure 2-10b  Suction tip positioned labially (anterior teeth)
2.8 Instrument Transfer

One of the main duties of the dental assistant is to transfer instruments and supplies to and from the operator quickly and safely. As a large proportion of chairside time is devoted to this aspect of dental assisting it is necessary to develop an efficient method of transferring these items to and from the operator. By applying work simplification techniques and the principles of motion economy such a technique can be established.

Unnecessary movements (in terms of both length and number - Principles of Motion Economy) can be eliminated when instruments and materials are passed in such a fashion as to prevent the operator from having to reach for these items. Time can be saved by a standardisation of the operating sequence so that the assistant can anticipate the operator's needs as the procedure progresses. This results in smooth and efficient instrument transfers between the operator and assistant. The instrument transfer technique described below is designed to eliminate Class IV and V movements and allow the operator's eyes to remain fixed on the operative field, resulting in a reduction of eye fatigue.
2.8.1 Parallel Instrument Transfer

This instrument transfer technique requires the use of only one hand by the assistant (the left hand when assisting a right-handed operator). This frees the other hand of the assistant for other tasks such as use of the suction tip to facilitate soft tissue retraction, drying the operative site or delivering materials.

There are six stages of transfer:

1. Working stage (Figure 2-11a). The assistant's left hand is holding the next instrument to be used. The instrument is held by the non-working end at the junction of the shaft and shank and parallel to the one being used.

2. Signal stage (Figure 2-11b). The operator lifts the instrument (in the same direction of use) from the tooth using a Class I movement, while maintaining finger rest and eye fixation. The assistant's position remains unchanged.

3. Pre-transfer stage (Figure 2-11c). The assistant grasps the instrument from the operator with the little finger of the left hand. By closing the little finger the assistant "palms" the instrument so that it is firmly and safely held away from the patient's face.

4. Mid-transfer stage (Figure 2-11d). The assistant places the next instrument in the operator's hand. The working end of the instrument is oriented in the direction of use.

5. Completion of transfer (Figure 2-11e). The operator now grasps the instrument.

6. Working stage (Figure 2-11f). Using a Class I movement the operator moves the instrument to the tooth.
2.8.2 Modified Instrument Transfer

2.8.2.1 Double-handled instruments (Figure 2-12)

When passing a double-handled instrument the assistant holds the instrument in the left hand close to the working end. After the assistant retrieves the instrument in the usual manner the operator breaks finger rest and turns the palm up to receive the instrument with the working end pointing in the direction of use.

When retrieving double-handled instruments the assistant readies the next instrument for transfer. Once the operator has finished using the instrument it is returned to the transfer zone (as for when receiving the double-handled instrument). The assistant retrieves the instrument with the little finger, ring finger and middle finger. The operator returns to the finger rest position to receive the next instrument.

2.8.2.2 Handpiece transfer (Figure 2-13)

This is an extremely useful transfer when use of the handpiece is not completed but the operator wishes to check the tooth preparation. The movements of replacing the handpiece, returning to the mouth and then retrieving the handpiece for further use can be eliminated by a simple transfer. The assistant retrieves the handpiece as for a double-handled instrument (operator signals with a Class I movement) and places the probe pointing in the direction of use into the operator’s hand. When the operator has finished using the probe the assistant retrieves the instrument in the prescribed manner and places the handpiece (bur pointing in direction of use) back into the operator’s hand. During these transfers the operator has been able to maintain finger rest and eye fixation.
Figure 2-12  Double-handled instrument transfer

Figure 2-13  Handpiece transfer
2.8.2.3 Anaesthetic syringe transfer (Figure 2-14)

Most patients fear the dental injection more than any other phase of dental treatment. It is the responsibility of the operating team to make this task as atraumatic as possible. An important part of this procedure is to keep the syringe out of the patient’s view during its preparation and delivery. This is often referred to as the "hidden syringe transfer".

The operator’s left hand is used to retract soft tissue, palpate anatomical landmarks and hold the patient’s head in the desired position. The palm of the dentist’s right hand is extended to the assistant’s side of the transfer zone with thumb, forefinger and middle finger extended to receive the syringe. The assistant, holding the syringe with both hands, places the ring on the operator’s thumb and rests the syringe between the forefinger and middle finger. The assistant retains hold of the barrel of the syringe while removing the needle cap and orienting the bevel of the needle to the correct position. The assistant then releases the syringe.

After the local anaesthetic has been administered the operator returns the syringe to the transfer zone. The assistant does not reach for the syringe until the operator’s hand is completely still. The assistant then grasps the barrel of the syringe and replaces the needle cap. The thumb ring is then removed and using both hands the syringe is returned to the work surface. If the assistant does not feel comfortable resheathing the exposed needle there are many devices available on the market which protect the assistant’s hand during resheathing.
2.8.2.4 Amalgam carrier transfer (Figure 2-15)

The assistant holds the loaded amalgam carrier with the left hand close to the working end. After the operator signals (Class I movement) the assistant retrieves the instrument with the little finger. The operator then moves the hand into the transfer zone and receives the carrier in the palm between forefinger and middle finger. The working end of the carrier is returned to the transfer zone where it is retrieved by the assistant’s little finger. The operator then returns to the mouth and re-establishes finger rest before receiving the next instrument.
Figure 2-14 Anaesthetic syringe transfer

Figure 2-15 Amalgam carrier transfer
2.9 Rubber Dam

In 1962 Ireland wrote:

"Dentists devote much of their time to attending meetings, taking postgraduate courses, and reading scientific books and journals. Presumably their purpose is to learn how to render a better service, to perform it with greater ease, and/or to perform it more expeditiously. Why, then, is the rubber dam, which will aid them in all these objectives, used routinely by only two to four per cent of them? Probably no other technic, treatment, or instrument used in dentistry is so universally accepted and advocated by the recognised authorities and so universally ignored by the practising dentists."

Going and Sawinski (1967) from a survey of 2,000 dentists in the United States of America showed that rubber dam was seldom or never used by over 80 per cent of the 1251 responding dentists.

The use of rubber dam in dentistry has been reported in the literature as early as 1877 (Elderton, 1971a). Since that time many writers have given reasons why it should be used. In 1908 G.V. Black in his textbook "Operative Dentistry" wrote:

"Finishing the enamel wall should always be done with the rubber dam in place and with all provisions made for the immediate placing of the filling material. The rubber dam should be in place for all amalgam fillings, the same as for gold, before the enamel walls are finished...it is as impossible to make a good amalgam filling as it is a good gold (foil) filling with any moisture present."

Prime (1937) has listed 57 reasons why rubber dam should be used. Stebner, also in 1937, published the results of a study which showed the rubber dam to save an average of seven minutes in preparing and placing a Class II amalgam restoration.
Rubber dam is one of the most useful devices available to the dental operating team that facilitates four-handed dentistry. The retraction of the cheeks, lips, tongue and gingivae by the dam provides for superior access. Visibility is greatly enhanced by the improved access and absence of saliva and blood, as well as the colour contrast provided by the dark coloured dam. The rubber dam provides for greater patient management, protection and comfort. With the patient being treated in the supine position, the dam provides complete protection against the swallowing or inhalation of debris or objects such as pins and endodontic instruments. The rubber dam is a physical barrier between the patient and the operating team and therefore can significantly minimise the risks of cross infection (Cosgrove, 1979).

A properly placed rubber dam prevents saliva from obscuring and contaminating the operating field. This is important when one considers the deleterious effects of moisture contamination in pulp capping procedures, on restorative materials and on luting agents. Operating time is decreased due to improved patient management and better access and visibility.

2.9.1 Rubber Dam Equipment

2.9.1.1 Rubber dam

Rubber dam is soft latex rubber sheeting manufactured in various thicknesses and colours. The thinner the dam, the easier it is to apply but the greater the tendency to tear. The heavier the dam the more resistant it is to tearing, the better it grips the necks of the teeth and the more efficiently it retracts gingival tissues. A dark coloured dam should be used to provide favourable colour contrast. Rubber dam comes in rolls or in pre-cut squares, with 15 centimetre square dam the ideal size (Brinker, 1972; Chasteen, 1978; Cosgrove, 1979; Elderton, 1971a; Ireland, 1962).
2.9.1.2 Rubber dam clamps

The rubber dam clamp is a metal clip made up of a pair of jaws (which grip the tooth buccally and lingually) connected by one or two sprung bows. The clamp helps retain the dam on the teeth and provides some degree of gingival retraction.

A wide variety of clamps is available in either winged or wingless styles. The main function of the wings is to engage the rubber dam in the clamp. This is an integral part of one specific method of rubber dam application which will be described later. The choice of clamp to be used should provide for patient comfort, minimal soft tissue injury and clamp stability.

2.9.1.3 Rubber dam punch, clamp forceps and frame

The rubber dam punch is used for punching holes in the rubber dam. The punch must be sharp and exact so that each hole is clean cut. This ensures there is no weak edge from which a tear may develop. The punch should have adjustments to vary the size of the required hole to match the teeth being isolated. Before punching the holes it is important to observe the teeth to be isolated by the rubber dam. The spacing between the holes should be the same as the spacing between the long axes of the teeth. Any malpositioned or missing teeth should be noted. The holes are punched in the dam in exactly the same relationship as that of the individual teeth in the arch.

The clamp forceps are used for placing, adjusting and removing rubber dam clamps. They grip the clamp with a mechanical advantage which allows the spring of the clamp to be overcome.

The rubber dam frame is used to support the dam once it is positioned in the mouth. The frame holds the dam off the patient's face, allows for easy breathing and
provides soft tissue retraction by the dam. The frames may be metal or plastic. Plastic frames are preferred for endodontic procedures.

2.9.1.4 Accessories

The use of a template to mark the dam prior to punching holes is useful in helping to eliminate the guesswork in positioning and orientating the dam. The template is a sheet of square plastic with appropriately positioned holes. It is divided into quadrants and positions are indicated for deciduous and permanent teeth. In arches with badly positioned teeth, Carter (1962) describes a technique for fabricating a custom-made template. The patient bites into a square of wax which is sufficiently large to cover the complete arch of teeth involved. The wax is placed over a flat sheet of rubber dam and the indentations in the wax are pierced by a pencil to the underlying rubber.

An alternative to the template is the use of a rubber dam stamp. This is an inked rubber stamp designed to produce a series of dots on the rubber dam corresponding to the positions of the teeth of an average person. The stamps have two groups of dots, one each for the permanent and deciduous dentition. Holes are punched through the desired dots and accurate positioning results. Malalignment of teeth can be allowed for while punching the holes in the dam.

The rubber dam napkin is made from a soft, absorbent cloth and is placed under the dam to prevent the rubber dam from lying directly against the patient’s face. It absorbs any perspiration or saliva from the patient thereby adding to patient comfort. When the dam is removed the napkin is useful for wiping the patient’s lips.

The use of a lubricant is an optional accessory that can help with placement of the rubber dam. A water soluble lubricant (such as shaving cream) placed on the undersurface of the dam around the punched holes facilitates the passage of the
interseptal rubber through contact areas between the teeth. Once the dam is in place any remaining lubricant can be washed and dried away.

2.9.2 Practical Considerations in Rubber Dam Placement

2.9.2.1 Patient information

It is most important that patients understand exactly why the dam is being used and how it will feel once it is in place.

One excuse usually given by dentists for not using rubber dam is "patients don’t like it." However, if patients were aware of the deleterious effects of saliva on the exposed pulp or of moisture upon all dental materials, they would not only choose the rubber dam, they would demand it. If patients were aware of the superior quality of dentistry that can be performed by using the rubber dam their compliance with its use would be significantly enhanced.

2.9.2.2 Anaesthesia

Rubber dam clamps, especially those designed to be used on partially erupted teeth, can be painful. If patients are to be confident in the use of the rubber dam it is essential that the application be a painless procedure. As the tooth to be restored will usually be anaesthetised, it is a simple matter to ensure that the tooth to be clamped is also anaesthetised. In certain instances (when subgingival clamps are being used) anaesthesia of both buccal and lingual (palatal) gingiva may be necessary.
2.9.2.3 Isolation of teeth

Satisfactory anchorage of the rubber dam is the most important factor in determining the efficiency and effectiveness of rubber dam isolation. Access to the site of operation and stability of the rubber dam usually make it necessary to isolate a minimum of two teeth on either side for anterior teeth and a whole quadrant for posterior teeth.

Rubber dam application is made easier if more teeth are exposed than those actually to be operated on. The more teeth isolated, the better the rubber dam is held in position and the better the access and visibility to the site of operation.

When operating on posterior teeth the dam should extend anteriorly to the midline. The clamp should be placed, where possible, on the tooth distal to the one under treatment. When work is to be performed on anterior teeth the dam should extend from the first bicuspid on one side to the first bicuspid on the other side. Due to their shape, the canines are ordinarily the poorest teeth in the mouth for retaining the dam. When they are used, the dam is not held far enough away from the lingual surfaces of the anterior teeth to afford good access. During endodontic procedures usually only the tooth to be operated upon is exposed. Similarly, if only a single occlusal restoration is to be placed it is far simpler to isolate only that tooth.
2.9.2.4 Inverting the rubber dam

The use of high quality heavy rubber dam usually makes this procedure unnecessary. The rubber is usually sufficiently strong and elastic to usually form a watertight seal around the tooth. However, if the dam is leaking or increased clinical crown access is required it becomes necessary to invert the edges of the dam. This can be achieved simply and quickly. The rubber dam is stretched away from the teeth so the edge is not touching the tooth. The assistant then dries the neck of the tooth with a stream of air. As the dentist slowly releases the dam a blunt instrument (such as a flat plastic) is run along the necks of the teeth and used as an inclined plane to cause the rubber to invert.

Ligatures (dental floss) may be used as an alternative or a supplement to inverting the dam in some situations. Cavity varnish applied at the area of inversion can help provide a better seal, if required.

2.9.2.5 Protecting the rubber dam

For operative procedures involving a proximal surface a wooden wedge placed in the interdental space will give protection to the dam. Insertion is facilitated by stretching the dam out to the side and allowing it to return to the interdental area carrying the wedge with it. An added advantage of using the wedge is that it will aid in retracting (depressing) the gingival tissue.

2.9.2.6 Matrix bands and the rubber dam

Problems may be encountered when placing a matrix band on a tooth isolated with rubber dam. The dam can get caught between the band and the tooth. To prevent this simply stretch the interproximal dam out strongly to one side as the matrix is placed. Placing a matrix retainer on a tooth which bears the rubber dam clamp may
prove difficult. Before placing the retainer it is important to have the band just wide enough to fit over the tooth. This prevents the retainer from interfering with the clamp. In situations where there is a deep (subgingival) preparation it is often necessary to remove the clamp prior to placing the matrix retainer. The dam can be held in place with the fingers as the retainer is positioned. Upon removal of the matrix band the clamp can be reapplied to the tooth or the dam removed entirely at this stage.

2.9.2.7 Breathing difficulties

If the patient is a mouth breather or is unable to breathe through their nose due to a cold a hole can be cut in the dam away from the operating site. This technique can also be utilised if the patient is an active salivator as it gives the assistant access to the posterior regions of the mouth for suctioning.

2.9.3 A Simplified Technique for Rubber Dam Placement

2.9.3.1 Placement

1. Pre-assemble the rubber dam apparatus. Ideally this is done prior to the patient arriving and is added to the tray set-up. If unsure of the clamp to be used or teeth to be isolated this can be checked after local anaesthetic has been given. The apparatus can then be assembled while waiting for the onset of anaesthesia. In this technique a winged clamp is placed into the most posterior hole in the dam with the bow of the clamp toward the distal. The frame is attached loosely to the top and bottom edges of the dam. The forceps are placed onto the clamp and secured so that the clamp is in a slightly sprung position.

A wingless clamp can be used, but it needs to be secured in the dam (most posterior hole) so that the jaws of the clamp are located on the tooth side of
the dam. The forceps are attached to the clamp and are also on the under side of the dam. Vision may be partially obscured when placing the clamp, so a winged clamp is preferable.

2. Administer local anaesthetic.
3. Inform and instruct patient.
4. Place rubber dam napkin.
5. Place rubber dam assembly with clamp over anchor tooth. Ensure clamp stability and minimal soft tissue trauma. Remove dam from wings of clamp (flat plastic). The clamp should engage the tooth at four points.
6. Position the holes over the teeth to be isolated. Beginning with the most anterior hole ease the rubber dam septa between the teeth and seat proximally with floss.
7. Adjust the tension of the dam on the frame. Adjust the dam for breathing comfort (if necessary) by folding the dam under the patient’s nose or cutting a space for the nose.
8. Place ligatures (floss) or stops (small pieces of dam) as required to ensure adequate seal and stability. The dam may be inverted at this stage if needed.

2.9.3.2 Removal

1. Clear dam of any debris.
2. Remove any ligatures or stops.
3. Stretch and lift interproximal dam (assistant with Dycal applicator) and cut on facial side (operator).
4. Remove clamp.
5. Remove dam and frame assembly.
6. Wipe patient’s face and lips (rubber dam napkin).
7. Rinse patient’s mouth.
8. Check dam for missing fragments.
2.10 Summary

This chapter has provided the reader with an in-depth analysis of the fundamental principles required for a DAU programme. Basic criteria for all the major items of equipment have been listed. It is essential that any dental practice (institutional or private) has equipment that allows the operating team to practise dentistry in an efficient and comfortable fashion.

A thorough understanding of the principles of motion economy and work simplification are necessary if both the operator and assistant are to avoid movements that consume time or produce fatigue. Similarly, merely sitting down to operate without correctly positioning the patient or the operating team is not sufficient. The seated position should provide favourable access and visibility to the patient’s mouth, a reduction of Class IV and V movements and comfort and safety for the operating team.

By applying work simplification techniques and principles of motion economy a standardised technique for passing instruments and materials between operator and assistant can be established. As instruments and materials are frequently exchanged between members of the operating team this technique needs to be simple, safe and efficient.

The use of a pre-set tray system has many advantages. The most obvious of these is the simplified and efficient means of instrument delivery which significantly reduces "down time" between patients. Trays help promote an orderly flow during any procedure, help maintain an accurate inventory and enable the surgery to become a treatment room rather than a storage room for a multitude of instruments and supplies.
The advent of high-speed suction has facilitated the development of sit-down four-handed dentistry. With the patient in the supine position and the use of high-speed cutting techniques, the use of some oral evacuation technique is essential to afford comfort and safety for the patient. The use of high-speed suction has been shown to save from as much as 15 to 20 per cent of chairside operating time.

The routine use of rubber dam has proven to be one of the most beneficial adjuncts to four-handed dentistry. It provides for maximum isolation and evacuation of the operative field. It retracts soft tissues for better access and visibility. And it provides greater comfort and safety for the patient, through the prevention of swallowing or aspiration of dental materials, devices or debris.
CHAPTER 3

THE DEVELOPMENT OF DAU PROGRAMMES IN THE USA

3.1 Introduction

The 1950’s in the USA was a period of growing concern regarding the ability of the profession to meet the increasing demand for dental care. Predictions of an ever increasing population, along with increased income and education, helped prompt the call for a larger, more efficient pool of dental manpower. The ensuing years were to see various capital and construction grants by the Federal Government to increase the number of dental school graduates, thus the size of the manpower pool. DAU programmes, also initiated by the use of federal funding, were to become the means of increasing the efficiency of this manpower.

In 1958, Dr Walter Pelton, then Chief, Division of Dental Resources, United States Public Health Service, stated:

"the primary problem in dental manpower is much easier to state than to solve: the current national ratio of civilian dentists to civilian population is little better than that existing during World War II and the ratio continues to grow worse. At the same time, the public’s ability to purchase dental care is at an all time high. Together, these facts mean that we are faced with a critical shortage of dental manpower."

The increasing seriousness of the manpower situation led to a series of related activities by various groups to address the problem. The Division of Dental
Resources, USPHS, studied manpower requirements and supply in individual states and the nation as a whole. Analyses were also done of educational expenses of dental students and of the financial structure of dental schools. The Council on Dental Education for the American Dental Association not only aided these studies but, in conjunction with the Council on Dental Health and the Bureau of Economic Research of the American Dental Association, independently explored the manpower problem. In addition, the W.K. Kellogg Foundation, through a series of grants to Regional Education Boards, did much to promote regional activity in manpower planning. The efforts of the American Dental Assistants’ Association to raise the standards of skill and knowledge of its members gave added impetus to the entire planning movement.

The results of this research and study led to two strategies to overcome the manpower problem. Firstly, there was a need to increase the number and the training capacity of dental schools, thus graduating a greater number of dentists. Secondly, the productivity of individual dentists had to be increased, meaning that each dentist could treat more patients. The need, as it was seen then, was to teach dental students the efficient use of chairside assistants so that, ultimately, their services as practitioners would also go further.
3.2 The Pilot Programmes

In 1956 the American Dental Association persuaded the US Congress to greatly increase funds to the Public Health Service for dental research. Accordingly, $US86,000 was set aside for the establishment of a pilot research programme in dental schools to determine the best methods of training dental students in the use of chairside assistants (Anonymous, 1968b; McCormick, 1981).

In preparation for the expenditure of funds for this project a planning conference was held in August 1956, sponsored by the Division of Dental Resources, USPHS (Pelton, 1958). Representatives were invited from the Council on Dental Education and Council on Dental Health of the American Dental Association, the American Association of Dental Schools and from 10 dental schools. The chosen schools were selected for geographic representation and most were schools not then receiving support from Public Health Service grants for other types of research. The dental schools chosen were from the Universities of Alabama, Southern California, Illinois, Indiana, Iowa, Minnesota, Kansas City, Nebraska, North Carolina and Marquette.

An extract of the conclusions and recommendations of the Planning Conference were as follows:

"The Committee has thoroughly studied the advisability and practicability of instituting an experimental programme in one or more dental schools, dealing with the problem of training dental students in the effective use of chairside dental assistants as an available means of improving the utilisation of dental manpower.

Summary of deliberations:

I. The Committee is of the unanimous opinion that the training of dental students in the use of auxiliary personnel is an educational discipline which should be incorporated into the dental school curriculum."
II. It was agreed that such a programme may result in:
A. The students achieving a prescribed academic qualitative and quantitative threshold earlier in their clinical experience.
B. The freeing up of instructional time which may open new vistas in curriculum planning.
C. The creating of a demand for qualified auxiliary personnel by recent graduates who have had this type of instruction in their dental school.

III. It was agreed that every dental school should embark upon an experimental programme in the training of dental students in the use of auxiliary assistants wherein:
A. The concept has the endorsement of the faculty.
B. The teaching facilities are adequate or can be expanded to meet the educational needs of a programme of this type.

IV. It was deemed essential by the Committee that it be the prerogative of the participating dental school to set up its own experimental programme with respect to:
A. The selection of faculty.
B. The course content.
C. The duration of dental students’ training.
D. The operational pattern by departments.
E. The administrative and fiscal procedures."

By early 1957 six dental schools had implemented programmes in training dental students to use chairsides assistants. These dental schools were from the State University of Iowa and the Universities of Alabama, Illinois, Kansas City, Minnesota and North Carolina. Each of these pilot programmes was to operate for four years and be the subject of ongoing evaluation.
3.2.1 Methodology of Teaching

Under the terms of its agreement with these schools, the Division of Dental Resources, USPHS, was to pay the salaries of the chairside assistants and other special personnel required for the project and to purchase certain amounts of required equipment. The Division was to receive an annual progress report from each participating school and act in general as a central information centre for all participants. Otherwise, each school was to have complete autonomy, designing and evaluating its own programme. Since its contract with the Division was renewable annually, each school could, if it chose, revise its plan each year. Consequently, a desirable degree of variation among projects was achieved. However, most of the participating schools were interested in measuring the impact of the special training upon both the quality and the quantity of the students' work. At the same time, each programme had its own particular emphasis and details (US Department of Health, Education and Welfare, Public Health Service, Division of Dental Resources, 1960).

As part of the programme in North Carolina, five senior (fourth year) dental students were randomly selected. Each student was assigned a special chair and unit in the general clinic for the entire year. A full-time dental assistant was assigned to the student for not only work in the general clinic, but in all other phases of the students' training (e.g., diagnosis, surgery and laboratory training).

Alabama's programme was designed to discover how effective a dental assistant could be in improving the work of both below average and superior students, and to speed up the clinical training of certain students in order to free some of their time for special research projects.

Minnesota used the entire senior class in its experiment, dividing it into three groups. Members of Group A were first taught to work with assistants and then required to work without them. Members of Group B first worked without assistants and were
then provided with them. Members of Group C never worked with an assistant. This technique permitted a number of "before and after" comparisons to be made, both in quantity and quality of work and in attitudes.

At the University of Illinois special emphasis was given to the breadth of training. Students received instruction in working with assistants in every division of the school and at every level of experience from the sophomore (second year) through junior (third year) to senior (final year) years. These students received on average 100 hours work per academic year with a dental assistant.

Kansas City, in its experiment, tried to reproduce as nearly as possible the actual working conditions of a private dentist's office. Five completely equipped operating rooms, each staffed with a dental assistant, were provided. Each surgery had its own appointment book and daily log maintained by the assistant. Every senior student was assigned to one of these surgeries for a minimum of two weeks, during which the student and the assistant, with staff supervision, acted as a professional team.

Iowa emphasised a concentrated five week period of training for every senior student whilst in the children's clinic. An assistant was assigned to each student who addressed all the oral problems of the child patient with the exception of major surgery and orthodontia.

3.2.2 Results of the Pilot Programmes

In order to evaluate these experimental programmes, two conferences were held between representatives of all the participating universities and the Division of Dental Resources personnel. At the first, in 1958, only very tentative assessments could be made. By 1960, when the second meeting was held, the schools were able to make more valid judgements.
Without exception, the participating schools reported that the chairside assistant projects had proved their value as judged by two standards: in the students' increased productivity as a result of working with an assistant in the clinic; and in the favourable change of attitude on the part of the students toward the employment of an assistant when they enter practice.

All of the schools which evaluated productivity, whether of individual students or of their clinics, reported favourable increases when the services of assistants were utilised. Illinois reported an average increase of 37 percent in surfaces restored over a year's time, while Minnesota, measuring the number of restorations completed in an hour, reported that the study group using assistants did 10 to 15 percent more than the group without assistants. Iowa reported that the gross income of its paedodontic clinic had doubled as a result of using assistants.

Alabama, which tested the effect of the chairside assistant on the work of students of varied scholastic standing, found that both the quality and quantity of work performed by superior and inferior students improved when the students were teamed with an assistant. In the first phase of Alabama's experiment, assistants were assigned to eight below average juniors in an effort to improve their standing. The grades of the group rose substantially after one semester. In a control group of the next eight lowest juniors, who worked without assistants, some maintained their grades but others actually dropped. In a second test, six of the highest ranking juniors, who had been on special research projects and were entering the clinic one semester behind their classmates, were assigned dental assistants. The group completed in one semester and one month of summer school more operative work than their classmates had in two full semesters in the clinic.

North Carolina, one of the schools interested in assessing the impact of training on student attitudes, conducted a poll of its senior dental students on practice plans; 94 percent of the students expected to employ assistants as soon as they began practice.
A study of attitudes at Minnesota also revealed that students in the experiment were convinced of the value of an assistant and that the students were even more favourably impressed at the end of the experiment than at the beginning.

In September 1960 the Council on Dental Education, American Dental Association and the American Association of Dental Schools, co-sponsored a Conference on Utilisation and Training of Dental Assistants. Pelton in an opening address summarised the results of the pilot programmes:

"All of the schools found that the use of chairside assistants increased the dental students' productivity. All of them agreed that it seemed to improve the students' attitudes toward the employment of assistants in private practice. Most schools reported that the use of an assistant improved the quality of a dental student's work. In one controlled experiment, for example, failing students who were assigned assistants achieved passing grades. One school reported an increase in the gross income of the paedodontic clinic where the training in utilisation was being given. One or more schools reported that the use of assistants shortened the time students needed to complete clinical assignments. One or more schools reported that the experiment in the schools is affecting the attitude of dentists already in practice, leading either to increased demand for the services of assistants or to greater interest in postgraduate training in their utilisation.

For it seems to me that the six pioneer schools, through their experiments, have satisfactorily demonstrated the facts basic to future developments in dental education. First, the training of dental students in the efficient utilisation of chairside assistants is feasible. Second, it increases both the quantity and quality of the students' work and reduces the time needed to complete various clinical
assignments. Thirdly, it influences the student to employ an assistant in his practice. The training, in short, accomplishes the three things most important to its effectiveness as a partial solution to our resources problem."

3.2.3 Review of the Pilot Programmes

In the contract executed by each of the schools participating in the project was a provision that the school would make its own evaluation of the effectiveness of its teaching methods. This approach was chosen in the hope that the schools would alter their teaching methods as the experimental findings directed, and that new and more effective techniques for educational research would evolve from these experiences. The Dental Student Training Advisory Committee felt that the concept of self evaluation had merit, since each school could profit in many ways from university or outside consultation regarding measurements of students' attitudes and abilities, and the practical application of scientific methods to teaching situations would be an important achievement.

Consideration had been given to the establishment of an evaluating standard for all schools. The Training Advisory Committee felt that any attempt to measure this programme, which was basically a search for new ideas and new approaches, by a preconceived standard, arbitrarily chosen, may well have defeated the purpose of the project. It was decided that when the programme was further advanced a formal measurement may be established. However, whilst the programme was in its formative stages evaluation should remain the responsibility of each separate school.
3.3 The National DAU Programme

As a result of the success of the pilot programmes grant money was provided by the US Congress, and the new Dental Auxiliary Utilisation Programme was established in 1961 to assist all dental schools in undertaking DAU programmes.

The objective of the National DAU Programme was to assist dental schools in developing a formal, continuing programme of classroom and clinical instruction in the practical methodology of team dentistry. The training, though short term, was intensive. The initial programmes concentrated on teaching dental students to work with chairside assistants. In later years it was broadened to cover the utilisation of other auxiliaries.

The DAU programme was administered by the Division of Dental Health of the USPHS, with the advice and assistance of an Advisory Committee on Dental Student Training. Committee members were drawn from several dental schools.

3.3.1 Funding

The US Congress annually appropriated funds for the support of the DAU programme and each year the appropriation provided for modest expansion in training activity.

The initial funding to the pilot programmes for the four year period 1956-57 to 1960-61 was in total $US86,000. For academic years 1961-62 through 1969-70 DAU grants totalled some $US18,000,000. In 1971 all DAU directors were notified that federal funding of the programme would be phased out, ending July 1, 1973. In the final year of federal funding, $US4,000,000 was allocated to the DAU programme (Anonymous, 1968b; Kazis, 1972; McCormick, 1981).
In 1965-66 a total of $US2,161,000 was spent on the programme. With approximately 3,500 dental students graduating in this year, it meant that about $US600 was invested through the DAU programme on each student (Peterson, 1966).

3.3.2 Objectives of the National DAU Programme

The objectives of the national programme initially were very broad in that they were directed towards the overall goal of increasing productivity, but without sacrificing the quality of treatment and the comfort of patients and operating teams.

By 1966 DAU and four-handed sit-down dentistry had become synonymous and all dental school graduates were receiving didactic and clinical instruction. A report by the Dental Student Training Advisory Committee of the USPHS dated September 22-23, 1966 listed the following minimal instructional objectives for an adequate DAU programme:

1. Instruction which focuses primarily on the effective use of chairside assistants rather than on clinical dentistry.
2. Use of modern equipment that permits the practice of sit-down dentistry.
3. Positioning of the patient, student and assistant.
4. Maintaining patient control.
5. Use of pre-arranged instrument trays.
7. Efficient use of water, air and evacuating equipment.

The objectives of the National DAU Programme were redefined at the Seventh National Conference on "Training Dental Students to Use Chairside Assistants", held in Chicago, Illinois, in April 1970, as follows:

1. To increase the productivity of all dental school graduates and to improve the quality of dental health services provided by the nation's dental workforce.
2. To provide dental students with a comprehensive, formal pre-clinical and clinical educational experience oriented to the effective utilisation of dental auxiliaries.

3. To provide dental students with an understanding of those concepts and principles which affect the utilisation of personnel, space and equipment.

4. To provide dental students with sufficient knowledge of auxiliary utilisation to augment the education of dental assistants in their future practice.

5. To provide an environment for continuing research in the effective utilisation of auxiliary personnel.

6. To develop a group of faculty whose major responsibility is to organise and direct the Dental Auxiliary Utilisation Programme and provide in-service training programmes for the entire faculty.

7. To encourage continuing education in dental auxiliary utilisation for practising dentists.

8. To encourage funding agencies and university administrators to provide significant increasing support for this important programme.

### 3.3.3 Guidelines for a DAU Programme

The Dental Student Training Advisory Committee identified what they considered to be the basic components essential to a successful DAU programme. These components, first presented in 1967, were seen as guidelines by which programme directors could evaluate their programmes. The following basic components were outlined at the Seventh National DAU Conference in April 1970.
3.3.3.1 Administration

The programme director should have operational and fiscal responsibility for the programme. The programme goals should be clearly defined and understood by the administration, clinical and pre-clinical faculty, students and auxiliaries. The DAU programme should be identified within the curriculum (e.g., bulletin listings, grades that reflect on transcripts, scheduled lectures).

3.3.3.2 Faculty

The faculty associated with the DAU programme may have the dual responsibility of teaching the principles of auxiliary utilisation and dental procedures. However, their major concern in the DAU activity should be the teaching of auxiliary utilisation. These faculty members should be skilled in the effective use of dental auxiliaries to assure full-time clinical instruction and supervision for the DAU programme.

3.3.3.3 Instruction

The programme director should actively participate in the instructional phases of the programme. Teaching methodology should include lectures, clinical demonstrations, seminars, audiovisual aids and the use of a manual of procedures. Each student should receive instruction in the principles and procedures related to auxiliary utilisation throughout the dental education experience. Students should be thoroughly oriented to the principles of utilisation of dental auxiliaries prior to clinical assignments.
Instruction in DAU principles in the effective utilisation of the chairside assistant should include:

1. Pre-planning of patient treatment.
2. Chair positioning for the patient, student and assistant.
3. Use of pre-arranged instrument trays.
4. Standardised sequential instrument usage.
5. Instrument exchange methods.
6. Use of water, air and evacuating equipment.
7. Preparation and delivery of restorative materials by the assistant.

Each dental student should demonstrate the ability to give direction to dental auxiliaries and should have sufficient knowledge of auxiliary utilisation to augment the education of these personnel if necessary. Behavioural objectives should be identified and used in the evaluation of each student’s performance.

3.3.3.4 Dental auxiliaries

Every effort should be made to impress each student with the health team concept. A skilled chairside assistant should be assigned to each student on a full-time basis during their DAU clinical training experience. Whenever possible, the dental assistant should be certified or certification eligible.

Dental hygienists should be part of the DAU programme, whenever feasible, so that students may be made aware of the contribution of the hygienist to total care delivery. Dental laboratory personnel should be included in the DAU programme when effective utilisation can be demonstrated. If employed, dental laboratory technicians should be experienced, preferably certified or graduates of accredited formal training programmes. As new types of auxiliaries are developed, DAU programmes are encouraged to develop procedures for their use.
3.3.3.5 Facilities

Clinical facilities in dental schools should be designed and equipped to teach students the effective use of dental auxiliaries and to permit the application of the team concept approach to dental treatment.

In those schools where clinical facilities are not so designed, a special area for DAU activities should be provided:

1. Treatment areas should be designed to assure achievement of all programme objectives.
2. Treatment areas should accommodate both right-handed or left-handed operators as well as an assistant, working in the seated position, with the patient supine.
3. Treatment areas should provide optimum traffic flow for patients, students, auxiliaries and instructors.
4. Utilities in treatment areas should be located to provide for maximum flexibility in the placement of equipment and for ease of maintenance and repair.
5. Support areas should be located to provide reasonable access from all treatment areas.

3.3.3.6 Evaluation and planning

Each programme director is encouraged to develop specific methods for evaluating the degree to which each student achieves the desired behavioural objectives. Each participating school has the responsibility to conduct a DAU programme which accomplishes the intent and purpose set forth and to apply inventiveness, experimentation and imagination to its conduct. Each school should consider broadening the scope of the DAU programme as soon as an effective basic programme in the utilisation of a chairside assistant is achieved.
Where feasible, experimental programmes designed to expand the functions of dental auxiliaries are encouraged, and may be incorporated or associated with the regular DAU programme. The ultimate objective of each programme should be to impart to each student an appreciation for and knowledge of the complete team approach in providing dental services.

3.3.4 Review of a DAU Programme

The Dental Student Training Advisory Committee was established as a technical review group under the aegis of the National Advisory Council on Education for the Health Professions.

Specifically, the Advisory Committee was charged with:

1. Reviewing applications for Dental Auxiliary Utilisation grant support and recommending appropriate action to the Advisory Council.
2. Assessing all DAU programmes, through site visits and annual reports, and recommending action if required.
3. Advising the Division of Dental Health on the general conduct, direction and progress of the Dental Auxiliary Utilisation Programme.

Two evaluations of the DAU programmes in each dental school were required. One was a continuing evaluation by the DAU programme director. The other was an evaluation by the Advisory Committee utilising information obtained during site visits and annual progress reports. Within the year prior to renewal of a grant a site visit team visited dental schools to review their DAU programmes. In evaluating the programmes, the committee was to:

1. Determine whether the programme was conducted to reflect the Dental Auxiliary Utilisation Programme objectives.
2. Determine the degree to which the basic components were present.
3. Assess the degree of progress made since the previous grant award.

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4. Assess the school's commitment to and support of the Dental Auxiliary Utilisation Programme.

5. Recommend an award of grant support for the school following review of the application and appraisal of the programme as described above.
3.4 Summary

The committee of a planning conference sponsored by the United States Public Health Service in 1956 decided that the training of dental students in the use of auxiliary personnel was an educational discipline that should be incorporated into the dental school curriculum. By early 1957 six dental schools had implemented programmes in training dental students to use chairside assistants. Each of these pilot programmes was to operate for four years and be the subject of ongoing evaluation.

Each school was to have complete autonomy, designing and evaluating its own programme. As a direct result of this a desirable degree of variation among projects was achieved. By 1960, without exception, the participating schools reported that the chairside assistant projects had proved their value as judged by two standards: in the students’ increased productivity as a result of working with an assistant in the clinic; and in the favourable change of attitude on the part of the students toward the employment of an assistant when they enter practice.

As a result of the success of the pilot programmes grant money was provided by the US Congress, and the new Dental Auxiliary Utilisation Programme was established in 1961 to assist all dental schools in undertaking DAU programmes. The main objective of the national programme was directed towards the overall goal of increasing productivity, but without sacrificing the quality of treatment and the comfort of patients and operating teams.

The Dental Student Training Advisory Committee was responsible for the administration of the national programme. This committee identified guidelines that they considered to be essential to a successful DAU programme. The committee also had the responsibility for reviewing and assessing each dental school’s DAU programme.
CHAPTER 4

DAU PROGRAMMES AT FOUR DENTAL SCHOOLS IN THE USA

4.1 Introduction

This chapter reviews the DAU programmes at four dental schools in the USA. These schools are located at the University of Missouri - Kansas City (programme commenced in 1957), the University of Kentucky (1963), the University of Texas - San Antonio (1973) and the University of Colorado (1976).

The University of Missouri was one of the schools which participated in the pilot programme while the University of Kentucky was one of the first schools to implement a DAU programme once the national scheme commenced in 1961. Both the University of Texas and the University of Colorado had DAU programmes which started up after federal funding had ceased. Similarly, both of these programmes were inaugurated as part of Training in Expanded Auxiliary Management (TEAM) programmes and did not exist as separate entities.

The DAU programmes at Missouri and Kentucky were directly funded by the United States Public Health Service and were substantially bigger programmes than those at Texas and Colorado. These programmes also existed as separate yet distinct departments (Kentucky from 1969) within faculty.

The information presented in this chapter comes from various journal articles as well as from DAU manuals from the dental schools discussed. These manuals were obtained from direct correspondence with those schools.
4.2 The University of Missouri - Kansas City

4.2.1 Introduction

In 1957 the University of Missouri - Kansas City (UMKC) School of Dentistry was one of six dental schools selected to participate in a pilot study to investigate methods of training dental students in the utilisation of dental assistants. The fundamental objective of their training programme was to introduce the dental student to the basic concepts of effective utilisation of the dental assistant to better prepare that student for the private practice of dentistry. Upon establishment of these objectives a grant was requested from the USPHS. The grant was approved. It was the desire of the USPHS that each recipient of a grant conduct its study on an individual basis to encourage different approaches to the problem.

4.2.2 Programme Development

Prior to the initiation of the experimental chairside assistant project, instruction in the utilisation of auxiliaries was limited to brief descriptions of the duties of chairside assistants during various lecture periods.

When the pilot programme began in March 1958, it was felt that no student should be denied the experience in the project. The assumption that some experience would be better than none resulted in the assignment of the entire fourth year class to the programme. This, of necessity, decreased the amount of time of exposure of each student. Each senior student was assigned to the chairside assistant project for a period of two weeks.

Due to the scarcity of trained dental assistants and the operational costs of such a programme limiting the salary scale, an accelerated programme in dental assisting
was inaugurated. Fifteen candidates with at least a high school diploma were selected for the accelerated course. From this group the four highest ranking from the 12 week course were selected for employment in the programme. A certified dental assistant with extensive private practice experience was selected as supervisor of the assistants and to serve as liaison with the co-ordinator and faculty. This assistant's responsibility constituted the close supervision of the assistants and the basic policies of the programme to ensure maximum efficiency in scheduling and in the operation of the clinic.

At the beginning of the programme four complete operating rooms were equipped, each with a modern unit, belt driven high-speed handpiece equipped with water and air, an oral evacuator, a motorised chair, operating stools, an auxiliary portable table and a portable cabinet. These four operating rooms were located so as to utilise a single X-ray machine and two autoclaves which were centrally located. This facility was in a clinic totally separate from the regular dental clinic. With the exceptions of periodontal and oral surgery, all disciplines of dentistry were practised in the project clinic. No treatment of any type was initiated without the presence of a chairside assistant.

During the week prior to their assignments in the clinic, the fourth year students were oriented by the project co-ordinator in the procedures to be carried out during their assignment to the clinic. Two films, "Dental Assistants: Their Effective Utilisation", and "Operation Team Work" were shown as part of this orientation.

In addition to supervision and instruction rendered by the co-ordinator and faculty staff, four practising dentists, whose offices were equipped with modern equipment and staffed with efficient auxiliary personnel, each devoted one day per week to the clinic. Demonstrations were conducted by each of these consultants in the efficient use of the two room dental surgery with two assistants and the proper utilisation of all facilities and personnel.
In 1961 the acquisition of four additional units equipped in the same manner increased the number of operating units to a total of eight. With this increase the assignment of students was increased to four weeks instead of two.

In 1970 the School of Dentistry moved into a new facility with 283 fully equipped treatment cubicles. Dental student class size increased from 90 to 160 students per class. The DAU staff expanded from 12 to 21 dental assistants in the following two years. The DAU programme was restructured in 1971 to provide a sequential learning experience for dental students from their first through fourth years. By 1975 only certified dental assistants were employed and they became known as Dental Auxiliary Utilisation Teacher-Assistants, (DAU T-A’s). A certified dental assistant was a graduate of an accredited dental assistant school who had successfully completed a national certification exam.

During the late 1970's the population growth had slowed considerably and it became apparent that the number of dentists being graduated was exceeding the demand. The dental school class size was reduced to 120 in 1981 and to 110 in 1985. The DAU programme staff was reduced to 16 DAU T-A’s in 1986 (Dental Auxiliary Utilisation Manual, 8th ed).
4.2.3 The Programme in 1986

First year dental students had a Clinical Assisting Course as part of their curriculum. The following extract was taken from the Outline for the Clinical Assisting Course:

"Course Description

The basic concepts of four-handed dentistry are covered in detail. Various dental instruments along with their nomenclature and use are discussed. Students will have the opportunity to apply knowledge and skill in the clinic by assisting dental students as they provide service to patients.

Method of Presentation

Lecture, demonstrations, class exercises and television tapes.

Course requirements

1. Attend 14 two hour sessions.
2. Apply objectives of course in the clinic.
3. Co-operate with department personnel for clinical application.
4. Maintain the UMKC School of Dentistry safety policies (glasses, gloves and masks) and dress code.

Objectives

After successful completion of all classroom and clinical sessions the first year dental student will be able to:

1. Disinfect and prepare a clinical cubicle for dental treatment procedures.
2. Position the patient in the dental chair so the patient is comfortable and is in appropriate position to receive dental care.
3. Sit in a functional team position both as an operator and as an assistant.
4. Identify dental hand instruments and burs and be able to describe their parts and functions.
5. Develop and maintain an instrument set-up for any given dental procedure to be performed, thereby promoting efficient time utilisation.
6. Utilise principles of four-handed dentistry to exchange instruments with minimum operator/assistant motion and maximum patient safety.
7. Properly clean and prepare instruments for sterilisation.
8. Load and deliver, away from the patient’s view, the anaesthetic syringe.
9. Maintain a clear and dry operating field using proper evacuation and retraction techniques.
11. Assist the operator in emergency situations.
12. Utilise standard symbols to chart existing conditions of the oral cavity."

Second year dental students performed simple operative procedures on patients during their second semester. The students were assigned in pairs - one carried out the procedure and the other assisted. A DAU Teacher-Assistant (DAU-TA) worked with four pairs of students to reinforce the basic concepts from the Clinical Assisting Course.

Student assignments with a DAU T-A began in the second semester of their third year and continued throughout their fourth year. This was a two week block assignment where the student and assistant functioned on a one-to-one basis. Every student received a total of four weeks experience with a DAU T-A. The student and DAU T-A provided patient treatment in all disciplines including periodontal surgery, oral surgery and orthodontics. The assignment commenced with an orientation seminar outlining DAU objectives and clarifying reasonable expectation levels for both the dental student and the DAU T-A. The student and the DAU T-A proceeded from department to department depending on the students’ patient scheduling during the two week period. Prior to the assignment in DAU each student received a copy of the DAU Programme Goals and Objectives:

"Goal
The goal of the DAU programme is to prepare the dental student for private practice. The DAU Teacher-Assistant (DAU T-A) will provide structured teaching and clinical practice in complete auxiliary utilisation during four-handed sit-down dental procedures."
The student will learn that an effective dental team can:

1. Save time and effort.
2. Reduce stress.
3. Offer better quality dental health care.
4. Increase productivity.

**Objectives**

The following objectives must be taught and practised to learn complete auxiliary utilisation.

A. Receptive

   The student must:

   1. Accept the DAU T-A as a teacher. Listen to and practise suggestions for complete auxiliary utilisation.
   2. Observe safety guidelines - glasses (self and patient), gloves and mask.
   3. Have adequate patients to practise DAU objectives in all areas.
   4. Plan a variety of procedures which allow auxiliary utilisation.
   5. Allow structured teaching time.
   6. Have good attendance.
   7. Be punctual.
   8. Maintain a professional appearance and conduct.
   9. Accept constructive criticism and suggestions without becoming defensive or argumentative.

B. Communication

   The student must:

   1. Communicate needs to the DAU T-A in a pleasant, friendly, but business-like manner.
   2. Discuss the treatment plan, problem patients, special medications and health problems with the DAU T-A.
   3. Inform the DAU T-A of the clinical schedule during the assignment and changes in that schedule.
4. Introduce the DAU T-A to patients.
6. Have complete control of conversations.
7. Inform patients of the procedures and finances.
8. Be aware of facial expressions denoting frustration or anger.
9. Be aware of undesirable or nervous habits.
10. Be aware of patients' expressions or gestures denoting anxiety or discomfort.

C. Delegation

The student must delegate:

1. In advance.
2. Politely and tactfully.
3. In a comfortable manner.
4. Completion of the appointment sheet.
5. Preparation of rubber dam.
6. Placing matrix, wedges and articulating paper.
7. Arranging of instruments in advance, at the beginning of the assignment.
10. Taking alginate impressions for study models.
11. Pouring impressions for study models and trimming them.
12. Construction of personalised impression trays.
13. Exposure and processing of radiographs.
15. Other legal functions, when feasible.
D. Time Management

The student must:

1. Schedule sufficient numbers of patients to be productive.
2. Appoint ample time to complete each scheduled patient without running overtime.
3. Start treatment immediately when patient arrives.
4. Utilise clinic time when a patient is not scheduled for DAU, e.g., teaching, laboratory, treatment plans.
5. Write appointment date and time on an appointment card.
6. Confirm appointment by telephone.
7. Correct frequent "no shows" or cancellations.
8. Have everything needed for procedure available.
9. Follow DAU T-A to set up for procedure prior to patient’s arrival.

E. Sterilisation and Organisation

The student must ensure that:

1. The mobile cabinet is clean at the beginning of the assignment.
2. The mobile cabinet is organised.
3. The mobile cabinet is stocked.
4. The instruments are clean.
5. The instruments are bagged and sterile.
6. The burs are clean and sterile.
7. The equipment is clean and disinfected.
8. Organisation of procedure set-ups during patient treatment is maintained.

F. Functional Team Positioning

The student must:

1. Sit with thighs parallel to floor and with feet flat on floor.
2. Use operator’s chair for support and keep back straight.
3. Use either chair or mobile cabinet for arm support.
4. Keep eye focus distance eight to twelve inches (20 to 30 centimetres).
5. Adjust patient’s head for best access and visibility of treatment area for operator and assistant.
6. Operate with elbows close to side at desk level.
7. Keep hands positioned so as not to obstruct assistant’s view.
9. Raise the seat of the patient chair up and lower back simultaneously.
10. Raise the base of the patient chair and lower the back of the chair so the operator may have his/her legs under the back and the patient’s head is resting in the operator’s lap.
11. Raise the back of the chair completely upright and lower the base before dismissing the patient.
12. Try indirect vision during the assignment.
13. Adjust the light for best visibility, keeping the light out of the patient’s eyes.

G. Instrument Transfer

The student must:
1. Allow the DAU T-A to transfer instruments when possible.
2. Transfer instruments back to the DAU T-A.
3. Allow the DAU T-A to assume a firm grip on the instrument.
4. Transfer instruments in the transfer zone - a six inch (15 centimetre) radius below the patient’s chin.
5. Allow the DAU T-A to wipe the stationary instrument with a gauze square instead of using the patient napkin.
6. Keep the fulcrum finger in position during transfer.
7. Accept the instruments utilising the proper grasps.
8. Use the lowest classification of motion.
9. Keep eyes within the brightly lit area."
There is no formal evaluation of first and second year students in the DAU programme. The course is credit or non-credit based on student participation. The DAU T-A’s evaluate the third and fourth year students on every assignment to the programme. The student’s evaluation is based on the objectives listed above and is part of the student’s Practice Management grade.

The DAU staff consists of 14 DAU Teacher-Assistants, one assistant supervisor and one supervisor. The assistant Dean for Clinical Affairs is ultimately responsible for the DAU programme and its personnel. The DAU supervisors teach the first year Clinical Assisting Course, oversee the second year student section, and plan all the DAU student assignments for the third and fourth year students. When the USPHS grant was phased out in 1973 UMKC assumed responsibility for DAU personnel salaries and totally funded the DAU programme as part of the overall budget for the School of Dentistry (Dental Auxiliary Utilisation Manual, 8th ed).
4.3 The University of Kentucky

4.3.1 Introduction

The original planning group responsible for development of the University of Kentucky (UK) College of Dentistry arrived in Lexington in July 1961. This group spent 15 months working on curriculum development, student and faculty recruitment, selection of equipment as well as developing the educational philosophy and policies under which the college would operate. The first class was accepted in September 1962. It was not until the following year, however, after major curriculum planning had been completed and after the first class had finished a year of dental school that the planning grant for initiation of the DAU programme was received.

The timing for initiation of the DAU programme was unfortunate. It was too late for the programme to be built into the original curriculum and co-ordinated with its major features. However, it was too early for curriculum revision as philosophical commitments had been made and educational principles were being tested in the early years of the school’s development.

4.3.2 Programme Development

4.3.2.1 Administration

The first DAU programme director was appointed in September 1963 under the auspices of the operative dentistry department. The appointment of the DAU programme director as a member of one of the clinical departments unfortunately had the effect of submerging the programme and denying the director natural access to the dean and the administrative team.
Discussions involving DAU policy, equipment and personnel were carried out at departmental level. The resulting decision making process precluded educating the administration concerning the needs of the programme and prevented the development of administrative interest in the programme and an understanding of its ambitions and difficulties. Thus, the DAU programme developed as a sub-programme of operative dentistry with the other departments only passively involved in planning and lacking a positive commitment to its implementation and success.

4.3.2.2 Programme objectives

The original legislation authorising the establishment of DAU programmes was directed toward providing a partial solution to the impending manpower problem in dentistry. The intent and purpose of the legislation was to assist the schools in motivating and preparing students for efficient utilisation of assistants with a view to increasing their productivity as practitioners.

Although the objective of the DAU legislation was the training of dental students, rather than of dental assistants, and it presupposed the use of experienced assistants in the training of students, this goal was not to be easily achieved. Since certified or experienced dental assistants were not readily available in the Lexington area, it was necessary to incorporate into the programme some mechanism for training the assistants who would participate in the training of students. However, it was underestimated the extent of the training programme necessary to produce a competent chairside assistant capable of serving in a teaching capacity. Coupled with this was the failure to anticipate the problems involved in training dental students with inexperienced assistants.

As part of the programme it was proposed to train students to train dental assistants at the same time that students themselves were learning to become proficient in the use of chairside assistants. This was rationalised by the fact that the graduating
students ultimately would be faced with training their own assistants and to design a programme this way would provide such experience. The effect of this was to compromise the realisation of the original objective.

In the early stages of the Kentucky DAU programme, three separate and distinct goals were intermixed and became blurred. These goals were to train dental assistants, to train dental students to utilise assistants and to train dental students to train assistants. Although it was felt that these goals were not necessarily incompatible, it was learned that it was pedagogically more efficient to separate these aspects of training than to expect the same portions of the training programme to function simultaneously in three ways.

4.3.2.3 Personnel

DAU funds were provided originally on a formula based on student enrolment. With a small early enrolment, funds were limited. To provide a maximum number of assistants with the resources available and to avoid open competition with practitioners in the Lexington area, salaries were commensurate with those in private practices. These were extremely low and affected the age and experience of the employee. It was felt that the mainly attracted recent high school graduates were perhaps more enamoured with the social possibilities than the career potentialities of the job. Those assistants who did become well trained often sought employment with private practitioners as university salary increments did not keep pace with the outside market.

Therefore, from early on, the programme was plagued with an extraordinary and self defeating turnover rate. From 1964, when the first three assistants arrived at the university, to January of 1970, a total of 59 assistants were employed with a maximum of 10 working at any one time. During this period the turnover from year to year averaged three of every four employed (Bohannan and Cooper, 1971). This
created a training problem of great magnitude, one which seriously affected the educational value of the DAU programme.

This turnover problem was rationalised on two grounds. First, it was considered acceptable because students at that time were involved in the training programme for replacement of assistants. Another "advantage" of the turnover was said to be the money saved during the summer months when clinical activity was minimal; these funds being subsequently applied to the employment of an additional assistant during the academic year. It took several years for the false economy of this policy to become obvious. It took even longer to accomplish the necessary policy changes in the university personnel office to provide adequately for the retention of trained personnel.

4.3.2.4 Facilities

In the early years of the college, faculty was acutely aware of the growing manpower problems and were in philosophical accord with the general intent and purpose of the legislation which created the DAU programme. At the same time, however, faculty recognised that some components of the institutional philosophy to which they were committed were in conflict with the suggested methods of programme implementation outlined by the granting agency. It was strongly recommended that there should be established a separate physical DAU facility apart from the general clinic in which students were to perform all patient care. Faculty was opposed to this policy both in principle and for practical (if not financial) reasons.

The general clinic had cubicles which accommodated solo operators. When the DAU programme was initiated these cubicles were adapted for student-dental assistant teams. The adapted cubicle was equipped with a modified unit, a conventional chair, mobile instrument cabinet, mobile stool and fixed storage cabinets. When assigned to work with a dental student the assistant brought a second stool, a mobile
instrument cabinet containing pre-prepared trays and a portable high-speed suction unit. This equipment, plus that already present, produced an overcrowded environment not conducive to optimum efficiency.

Faculty found it difficult to accept the concept that the DAU programme would best be served by creating a separate area, equipped differently from the clinic itself, through which students would be rotated. It was felt that students who used the special area and then returned to the traditional surgery would abandon the DAU techniques they had learned simply because the clinic area was not well designed to accept them. Thus, it was decided to use the traditional cubicle, assigning dental assistants to work with students in their own clinic areas.

Eventually, faculty acknowledged the advantages of equipment especially adapted for DAU training. In the autumn of 1967 two student cubicles were converted to a modified DAU area equipped for sit-down, four-handed dentistry. Two contour chairs and modified dental units were installed. When students began their rotations through these two areas, experience showed that this equipment did in fact have advantages over the previous design. Thus, in 1968 one additional cubicle was altered to accommodate DAU principles. The use of these three cubicles, combined with a continued assignment of dental assistants to the regular cubicles, provided DAU experience for the student in both settings.

4.3.2.5 Training programme

In addition to the divergent opinions regarding appropriate physical facilities for DAU training, another point of difference arose. The suggestion of the DAU National Advisory Committee that the training programme be limited to restorative procedures faculty found to be incompatible with their clinical teaching policy.
The Kentucky planning group had committed itself to a programme of comprehensive patient care. Under the system, students were expected to provide complete dental care for all patients assigned to them with no specific periods of time during which students were expected to work under one particular department. This comprehensive patient care system, without definitive requirements in the clinical disciplines and without block assignments, was fundamental to Kentucky’s philosophy.

Faculty also felt that structuring the DAU programme to include all disciplines would give visibility to the programme throughout the school and encourage the interest and participation of all departments. However, several difficulties were encountered which detracted from the development of maximum efficiency in the system. The assistant who aided the dental student in all clinical disciplines had to be familiar with the policies, procedures, special equipment and instruments used by each clinical department. As a majority of the assistants had little or no experience it was virtually impossible to provide them with a training programme that would familiarise them with the procedures of all departments before the start of the academic year.

The result of this overly ambitious and unrealistic training programme was a dental assistant incompletely trained and thus incapable of providing the refined assisting necessary for a sophisticated DAU programme. The efficient expansion of duties into other disciplines can only occur after the student has become comfortable with DAU procedures and the assistants have had extensive training and experience in multiple disciplines.
4.3.3 Revision of the DAU Programme

Early in 1969 all facets of the University of Kentucky College of Dentistry teaching programme, including the DAU programme, underwent close scrutiny and evaluation. The attention of the entire institution was directed toward developing a new educational approach in keeping with the changing social, economic and political circumstances of the times. The change in attitude of the Federal Government toward aid to education and health necessitated readjustments to the teaching programme. The drastic reduction in supportive funds and the announced termination of the entitlement grant concept precipitated a hard look at all federally supported programmes.

4.3.3.1 Administration

As part of the general institutional introspection, the administrative table of organisation was revised and responsibility for all auxiliary programmes was consolidated with the creation of a new position (Director of Dental Auxiliary Personnel) within the dean’s administrative team. This reassignment removed the DAU programme from sub-departmental level and established the much needed relationship between the programme director and the dean’s office.

4.3.3.2 Programme objectives

Efforts were first exerted towards resolving the confusion between training dental assistants, educating students for efficient use of trained chairsde assistants and producing graduates capable of training assistants. These three aspects of training were separated with the immediate focus on preliminary intensive training for dental assistants and on meaningful improvement of the programme for training students in the utilisation of assistants. Since training programmes for both hygienists and
technicians were already in operation at Kentucky, ways were sought to include them as part of the DAU programme.

The fulfilment of these altered and expanded objectives would require a meaningful commitment of university resources to the programme. It was felt unrealistic to expect federal support for all facets of the expanded programme in addition to funds for maintaining the programme then in operation. A request was honoured for new university funds to bolster the programme, thus the university accepted a share of the responsibility for the DAU programme.

4.3.3.3 Personnel

Until July 1969 all personnel directly associated with the DAU programme were supported entirely on the DAU grant. At that time extra staff were added at the university’s expense.

In an effort to combat the employee turnover problem, which had drastically compromised the attraction and maintenance of high quality personnel, an employee reclassification was introduced which included a significant change in salary scale, incorporating recognition for merit and experience. This policy proved immediately beneficial in attracting more mature and competent assistants.

4.3.3.4 Facilities

As part of the effort to obtain a meaningful university commitment to the programme, a grant of $US66,000 was sought, and received, to redesign and re-equip part of the fourth year clinic. A new cubicle design, based on suggestions by the Division of Dental Health, was approved, and a bay of 15 cubicles was renovated and re-equipped completely at university expense. In addition, a 400 square foot
seminar room immediately adjacent to the DAU clinic was remodelled to provide office space as well as a sterilisation area and a seminar room.

4.3.3.5 Training programme

In the development of a new and more effective DAU programme, a key element in the revision was a vastly improved training programme for dental assistants. This consisted of an intensive six week training programme totalling 200 clock hours. This was backed up by an in-service training schedule of four hours per week which, during the year, added a further 160 hours training. Thus, the overall educational programme for assistants amounted to 360 hours of instruction (Bohannan and Cooper, 1971).

The revised DAU programme was designed to take advantage of the early introduction of patient care to students. Students were not only introduced to DAU concepts via didactic instruction in the first year but also began clinical practice in the utilisation of chairside assistants in the first year courses in periodontics and restorative dentistry. Basic concepts of simplified instrumentation, pre-prepared tray set-ups, and patient positioning for sit-down dentistry were introduced at this stage.

As patient care was extended throughout the second, third and fourth years, an increasing amount of time was provided for the DAU programme. The time allocated in the curriculum to DAU training was carefully integrated with the clinical teaching programme.

There was a significant increase in the number of hours devoted to both didactic and clinical instruction in the revised DAU programme. In fact, the total time devoted to DAU throughout the students four year schooling was increased from 126 hours prior to 1969 to 538 hours in the revised programme (Bohannan and Cooper, 1971).
In addition to increasing the number of contact hours scheduled for the DAU programme, an effort was also made to improve the content of the teaching programme. First, second and third year dental students received didactic instruction in which visual aids were employed to demonstrate the concept of four-handed sit-down dentistry. Additional didactic instruction was provided in the courses taught by each clinical discipline. The fourth year students were assigned to the DAU clinic area for an 11 week period. As a preliminary to this assignment, each student received a five hour orientation designed to develop positive attitudes toward utilisation of auxiliaries. A further one hour seminar was held weekly during the DAU assignment. A valuable part of the clinic assignment was the use of meme-motion photography of the student while they were working in the clinic. This was later critiqued by both DAU staff and the student.

4.3.4 The Programme in 1978

4.3.4.1 Didactic course

The didactic course was given in two parts. The first section was given to students in their first month of school and consisted of five hours of lectures and demonstrations. This was to introduce the very basic DAU principles, such as tray set-ups and patient positioning. Each student also received a three hour orientation, by a DAU assistant, to the clinical facilities so that these principles could be utilised in pre-clinical courses.

The second part of the didactic course consisted of 10 hours of lectures in the student's third year, which provided an in-depth study of DAU principles. Then in fourth year, before clinical rotations commenced, each student received a three hour clinical orientation to review principles taught during the didactic course.
DAU Programmes at Four Dental Schools in the USA

Upon completion of the didactic component of the DAU programme, students were expected to have an understanding of the following principles:
1. Effective use of adequately trained auxiliaries.
2. Efficient pre-planning of treatment.
4. Use of standardisation of instrumentation.
5. Effective use of pre-planned trays.
6. Proper positioning of patient, operator and assistant.
7. Economy of motion to minimise fatigue.
8. Efficient instrument transfer.
9. Adequately designed surgery equipment.
10. Efficient use of central evacuation.

4.3.4.2 Clinical course

The DAU clinical rotation consisted of a five consecutive week rotation for nine senior students, each assigned a full-time chairside assistant. The students were scheduled for four weeks in the DAU clinic, utilising the services of a fully trained DAU assistant. During this time, pre-planning, along with other DAU principles, was stressed while the student carried out all disciplines of dentistry, except oral surgery. The senior students, with assistants, were then scheduled, as a final part of the DAU rotation, for one week in the College of Dentistry Emergency Room which was located in the DAU clinic. During this period of time delegation was stressed as a time management method, since pre-planning was impossible in the emergency room environment.

Upon completion of the DAU clinical course, the students were to be able to demonstrate competency in the following areas:
1. Pre-planning of treatment.
2. Simplification and standardisation of instrumentation.
3. Use of pre-prepared trays.
4. Operator, assistant and patient positioning to achieve maximum visibility of the operating field.
5. Efficient instrument transfer.
7. Basis delegation of duties to the dental assistant.

4.3.4.3 Number of hours in DAU curriculum

Table 4-1 provides a comparison of the number of hours devoted to both didactic and clinical instruction in the DAU programme from its inception in 1963 to the revised programme in 1969 to the programme as it stood in 1978.

As can be seen from Table 4-1 the total number of hours devoted to DAU training increased from 126 in 1963, to 538 in 1969, but then decreased to 144 hours in 1978. This decrease can be explained by two reasons. Firstly, federal funding of the DAU project ceased on July 1, 1973 and secondly, there developed a greater emphasis on Training in Expanded Auxiliary Management (TEAM), which was a natural progression from Dental Assistant Utilisation.

4.3.4.4 Personnel

Along with the DAU director, there were nine fully trained and experienced DAU assistants and one DAU supervisor employed full-time for exclusive use in the DAU programme.

Before being assigned to a student, all DAU assistants had to go through a 176 hour training programme to ensure standardisation of teaching objectives. Additionally, two years of experience or one year of formal training was required.
4.3.4.5 Facilities

In 1978 the DAU clinic consisted of 20 modernised and modular surgeries in a separate section from the general clinic floor. Each surgery was equipped with a contour chair, mobile dental carts, operator and assistant stools, central suction and specially designed corner cabinetry with sinks for both the operator and assistant.

The DAU clinic was supported by a sterilisation room from which pre-prepared trays were supplied to the students. All expendable supplies were also given to the students, which necessitated a supply room convenient to the clinic.
Table 4-1  Number of DAU training hours (University of Kentucky, 1963-1978)

<table>
<thead>
<tr>
<th>Year</th>
<th>1963</th>
<th></th>
<th></th>
<th>1969</th>
<th></th>
<th></th>
<th>1978</th>
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<tr>
<td></td>
<td>Didactic</td>
<td>Clinical</td>
<td>Total</td>
<td>Didactic</td>
<td>Clinical</td>
<td>Total</td>
<td>Didactic</td>
<td>Clinical</td>
<td>Total</td>
</tr>
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<td>1</td>
<td>10</td>
<td>3</td>
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<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
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<td>0</td>
<td>1</td>
<td>8</td>
<td>8</td>
<td>16</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
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<td>3</td>
<td>43</td>
<td>83</td>
<td>126</td>
<td>10</td>
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<td>30</td>
</tr>
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<td>115</td>
<td>121</td>
<td>24</td>
<td>309</td>
<td>333</td>
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<td>106</td>
<td>109</td>
</tr>
<tr>
<td>All</td>
<td>7</td>
<td>119</td>
<td>126</td>
<td>85</td>
<td>453</td>
<td>538</td>
<td>15</td>
<td>129</td>
<td>144</td>
</tr>
</tbody>
</table>
4.4 The University of Texas - San Antonio

4.4.1 Programme Development

By the early 1970's DAU programmes were augmented through the introduction of Training in Expanded Auxiliary Management (TEAM). The TEAM programmes were designed to enlarge the DAU concept and to prepare the graduate dentist to effectively utilise and manage dental auxiliaries both in their traditional functions and in their expanded functions as permitted under the Dental Practice Act of the state in which the auxiliary practises.

4.4.2 The Programme in 1986

In 1973 the DAU programme was initiated as a TEAM programme and was operated by the Department of General Practice. The programme was administered as a rotation and was offered only to senior (fourth year) students. The senior class size was 16 students in 1973 and 30 in 1974. There was only one surgery and one DAU assistant set aside for the DAU programme.

In 1975 the class size was increased to 152 students and separate facilities were constructed for the TEAM and DAU programmes. The DAU clinic then consisted of eight cubicles with eight chairside assistants and one assistant supervisor providing the staff. The didactic component of the programme was offered to junior students in this year.

In 1979 TEAM was renamed Practice Dynamics and was recognised as a division under the Department of Outpatients Clinic consisting of two programmes:

1. Simulated Private Practice.
2. Dental Auxiliary Utilisation.
By 1985 the class size had been voluntarily reduced from 182 to about 102 students. In 1986 DAU clinical experience was extended to sophomore (second year) students via a one-clinic-period rotation for groups of 10 students per session. Restorations were performed on manikins, utilising the skills of trained chairside teaching assistants.

In 1986 the number of surgeries increased by one to nine in an open bay set up. Each surgery had mobile cabinetry and an over the patient delivery system. Also in each surgery was a fixed video camera which was connected to a nine screen monitoring unit housed within the clinical area. There was capability for taping and playing back the activity at each surgery in time lapse mode of photography.

The DAU faculty provided five staff members in the director and four other dentists. This was complemented by a certified dental assistant who was responsible for nine other trained dental assistants.

The course content for the DAU programme consisted of understanding and demonstrating the following principles (Gildersleeve and Hardage):

1. Concept of four-handed dentistry.
2. Positioning of the operating team.
3. Establishing access and visibility.
4. Instrument transfer.
5. Hidden syringe techniques.
7. Selection of surgery equipment for four-handed dentistry.
8. Basic concepts of surgery design.
9. Pre-set tray system.
4.5 The University of Colorado

4.5.1 Programme Development

The DAU programme started in the foundling years of the dental school along with a TEAM programme. The first senior class at the school was in 1976 and in this year the DAU programme was initiated. There were 25 students in that first senior class. At this time 80 per cent of funding came from a federal grant, however over the years, federal money declined and state money did not increase dramatically. Federal support of the expanded function portion of the programme ended in the early 1980's resulting in the dental school dropping the expanded function assistant rotation for the dental students.

4.5.2 The Programme in 1986

There were 35 students in the final class of 1986. The DAU staff consisted of the course director, a DAU assistant supervisor and seven dental assistants. Financial support for the programme was through regular state funding of the dental school.

The didactic portion of the course was divided into two sections. Section one consisted of four hours of lectures in which the principles of four-handed dentistry, the practical aspects of working with a dental assistant and the policies of the DAU clinic were discussed. There were also 12 hours of clinical seminar sessions in which time students took turns acting as operator and assistant in the application and removal of rubber dam and restoration of teeth on a manikin, utilising and applying the principles of four-handed dentistry. The second section consisted of a final four additional lecture hours. Therefore total time scheduled for the didactic portion of the course was 20 hours.
The clinical component of the programme consisted of six weeks working with a single chairside assistant and one chair, a receptionist and a dispensary assistant. The senior DAU clinical component involved two separate but related types of activities: delivery of comprehensive patient care; and delivery of emergency care. During this time each student was to conduct two formal staff meetings with all staff on his or her team. The students were expected to plan, organise and lead the staff meetings. Students were to identify DAU related problems, solicit feedback and suggestions from team members and attempt to resolve problems and improve team organisation and co-ordination in the staff meetings.

The primary purpose of the clinical DAU rotation was to provide opportunities for students to develop skills needed to efficiently manage a dental practice. The rotation was designed to simulate as accurately as possible the private practice of dentistry so that the rotation provided a transition from the traditional academic environment to private practice.

The overall purpose of the rotation was reflected in the program objectives in which the student was to be able to (Bomberg and Barnes, 1976):

1. Demonstrate an understanding of efficient utilisation of a chairside dental assistant by effectively applying the principles of work simplification, motion economy, instrument transfer and positioning of providers and patients.

2. Demonstrate an understanding of the team approach to delivering dental care by effectively applying the principles and concepts relating to task delegation and quality assurance.

3. Demonstrate an understanding of personnel management in a dental practice by effectively applying principles and concepts relating to leadership and supervision, staff communications, auxiliary training and staff meetings.

4. Demonstrate an understanding of patient management and preventive dentistry by effectively applying principles and concepts relating to oral hygiene instruction, preventive therapy, patient management and recall systems.
DAU Programmes at Four Dental Schools in the USA

5. Demonstrate an understanding of office management by effectively applying principles and concepts relating to appointment scheduling and clinical records.
4.6 Summary

Experimental programmes in training students in Dental Assistant Utilisation were established at six dental schools in the USA in 1957. These pilot programmes ran until 1961 when the National DAU Programme was implemented. Federal funding was available for all dental schools until 1973 when such sponsorship was phased out. Beginning in the early 1970’s, and co-inciding with the abolition of federal support for the national programme, DAU programmes were augmented through Training in Expanded Auxiliary Management (TEAM) programmes.

The main emphasis in this chapter has been intentionally directed at two programmes that were established and operated during the period of federal support for DAU training programmes (1957 to 1973). One of these schools (Missouri) participated in the pilot programme from 1957 to 1961. Kentucky’s programme commenced in 1963, soon after the introduction of the national programme, and was revised in 1969 to present a more independent programme divorced from any other faculty department. The other two programmes (San-Antonio and Colorado) have been presented for general interest and as examples of programmes that were implemented after cessation of federal funding and existed as a component of each school’s TEAM programme.

At the University of Missouri, prior to the initiation of the experimental programme, instruction in the utilisation of auxiliaries was limited to brief descriptions of the duties of chairside assistants during lecture periods. During the experimental project each final year dental student was assigned to the four chair DAU clinic for a two week period. This facility was in a clinic totally separate from the regular dental clinic and with the exception of periodontal and oral surgery, all disciplines of dentistry were practised in the clinic. No treatment of any type was carried out without the presence of a chairside assistant. In 1961 the number of chairs in the DAU clinic increased to eight thereby allowing each student to receive an extra two
weeks of instruction in DAU. In 1971 the DAU programme was restructured to provide a sequential learning experience for dental students from their first through fourth years.

The University of Kentucky College of Dentistry opened in September 1962, but it was not until a year later that the DAU programme was implemented. This was after major curriculum planning had been completed and had the result of the DAU programme being incorporated as a sub-programme of the operative dentistry department. The original goals of the programme were to train dental students, to train dental students to utilise dental assistants and to train dental students to train assistants. It was found that these goals, although separate and distinct, became intermixed and blurred. In fact it was not until 1967 that student cubicles were converted to allow for four-handed sit-down dentistry and relocated into a physically separate clinical area.

In early 1969 all aspects of Kentucky’s teaching programme were re-evaluated. As a result of this the DAU programme came into existence as a separate entity in its own right. The initial goals of training dental assistants, educating students for efficient use of trained chairside assistants and producing graduates capable of training assistants were separated with an immediate focus on the meaningful improvement of the programme for training students to utilise chairside assistants. In the development of a new and more effective DAU programme was the provision of a new separate DAU clinic with 15 fully equipped surgeries. There was also a significant increase in the number of hours devoted to both didactic and clinical instruction in the revised DAU programme.
CHAPTER 5

DAU AT WESTMEAD HOSPITAL
DENTAL CLINICAL SCHOOL

5.1 Introduction

In Australia at the present time (1992) there exists no formal training for dental students in how to effectively utilise the services of the dental assistants that are provided for them. Dental students at the University of Sydney complete their fifth and final year of training at Westmead Hospital Dental Clinical School (WHDCS). In the fifth year clinics there is, at best, one dental chairside assistant per group of eight students. These assistants are used, for the most part, not at "chairside", but to obtain and deliver instruments and materials for the students.

This chapter presents an objective review of the Dental Assistant Utilisation Unit at Westmead Hospital Dental Clinical School. The unit was established as a separate department at the dental school's opening in 1981 and has continually expanded to its present level in 1992.

The main function of the programme is to train house dental officers in the principles of assistant utilisation. The other lesser component to the unit's activities is conducting continuing education courses for graduate dentist-assistant teams from private practice. The DAU unit has very little involvement at an undergradate level.

Presented in this chapter is an outline of the unit's administration, programme objectives, personnel, facilities and training programme.
5.2 The DAU Unit

In the planning and formative stages of the Westmead Hospital Dental Clinical School, DAU was seen as a necessary part of the dental school’s long term plan. The Dental Assistant Utilisation Unit was established as a separate, yet integral, part of the dental school upon its opening in December 1981. Since that time, the unit has developed and grown in line with the expansion of the dental school as a whole.

From its inception DAU has had separate clinical facilities, equipment and staffing. It has operated on an equal basis with other clinical departments and units such as Clinical Dentistry, Oral and Maxillo-Facial Surgery, Periodontics, Orthodontics and Paediatric Dentistry.

The Dental Clinical School was established and is funded through the New South Wales Department of Health. The original plan for the DAU unit was for it to eventually become an important part of the Faculty of Dentistry, University of Sydney, providing undergraduate training in Dental Assistant Utilisation. To this date, however, the unit remains solely a part of the Dental Clinical School, ultimately under the direction of the Health Department. There is only token exposure for dental students to principles of DAU. In fact, during the academic year 1991 only final year dental students received any instruction in Dental Assistant Utilisation. This instruction totalled a meagre eight hours. In 1992 third year dental students received seven hours of DAU instruction, one hour didactic and six hours clinical. Both fourth and fifth years each received two hours of lectures and six hours clinical DAU training.
5.2.1 Administration

In the original departmental structure within the Dental Clinical School, DAU, Paediatric Dentistry, Orthodontics, Periodontics and Community Dental Health all existed as individual units within the Preventive Dentistry Department. This meant that unit heads were responsible to the department head who in turn was responsible to the Director of Dental Services.

Since restructuring in 1991, each of these units now have direct line of command with the Director of Dental Services. This, in turn, has meant that all units now have their own budgets, thereby giving control of the ordering of equipment and materials to unit heads. Although ultimate responsibility for staffing lies with the Director of Dental Services, each unit head has a major input into the selection of personnel for their unit.

Fundamental to the operation and success of the DAU programme at Westmead is the separate and equal status that the unit has with all other clinical units. This has meant independence in determining teaching programmes, in financial control of the unit, in selection of equipment, materials and staffing and in the ability to liaise directly with supporting services such as nursing, clerical and laboratory.

5.2.2 Programme Objectives

The overall goal of the DAU unit is to teach health care providers how to work efficiently in a four-handed sit-down environment. Health care providers may be staff dentists, private practitioners, dental students, hygienists and chairside assistants.
The objectives of the DAU unit as listed in the Westmead Hospital Dental Clinical School DAU Manual are:

1. To provide facilities for the training of dental health care providers in the basic principles of DAU.
2. To provide routine dental care to all eligible patients.
3. To treat referred patients from speciality areas requiring routine dental care.
4. To engage in research related to four-handed dentistry or practice management.
5. To aid dental health care providers in understanding the basic principles of DAU by development of self instructional teaching materials.

Specific objectives for participants in the various training programmes offered have been identified. The following is an another extract from the DAU Manual:

By the end of the DAU rotation, the trainee will:

1. Position the patient to allow access and visibility to any area of the oral cavity.
2. Position him/herself to allow access and visibility to any area of the oral cavity.
3. Transfer instruments and supplies efficiently using the parallel instrument transfer technique.
4. Demonstrate the ability to plan ahead.
5. Communicate effectively with the other team member.
6. Retract soft tissue effectively.
7. Use time efficiently during patient treatment and between patients.
9. Use proper suction tip placement.
10. Set up efficiently for patient treatment.
11. Demonstrate an understanding of the zones of activity and motion classification.
5.2.3 Personnel

As discussed earlier, Westmead Hospital Dental Clinical School was established and continues to be a Health Department funded institution. To this end, there never has been any faculty association with the DAU unit. All the personnel working in the unit are therefore staff members of the hospital rather than members of faculty.

Starting with a DAU staff of one, the Programme Director, in 1981 the staffing level grew to three full-time members in 1984. In 1985 there were five full-time DAU staff and this figure grew to the present (1992) level of seven in 1986. The current staff is comprised of the Director, Registrar and two Dental Officer and three Chairside Assistant DAU Demonstrators.

The DAU Assistants are certified and assigned on a permanent rostering to the unit. A unique aspect to the roles that the DAU Assistants play is that they "teach" DAU to the rostered dental officers as they assist them.

A statement of duties for each of the DAU staff members is listed in the Westmead Hospital Dental Clinical School Policy and Procedures Manual and is set out below.

Director of Dental Assistant Utilisation

Brief Summary of Duties

  Responsible to the Director of Dental Services for the management and co-
  ordination of the department.

Detailed Statement of Duties

  The Director is responsible for:

  Administrative

  1. Recommendations regarding organisational structure, equipment
     purchasing and staffing for the department.
2. Control of departmental expenditure and preparation of departmental budgets.
3. Maintenance of a high standard of preventive dental care within the department.
4. Organisation of departmental meetings to discuss procedures, protocols and standards of care.
5. Liaison with nursing, reception and laboratory staff to ensure smooth operation of the department.
6. Maintenance of accurate records of treatment within the department.
7. Provision of suitable facilities for the clinical training of staff and undergraduate students in the department.
8. Organisation of in-service programmes in the department to encourage continuing education amongst staff.
10. Reporting as requested on personal activities in regional/community Dental Assistant Utilisation projects.
11. Day to day management of the Dental Assistant Utilisation department.
12. Appointing a deputy who shall temporarily be responsible for the department when the director is absent from duty for periods of one day or more.
13. Ensuring that the principles and practices of Equal Employment Opportunity (EEO) apply to all staff within the position’s responsibilities.
14. Complying with relevant Occupational Health and Safety requirements.
15. Ensuring a smoke free environment as is the policy of the Western Sydney Area Health Service.
Clinical

1. Compilation of appropriate records for all patient consultations and care.
2. Consultations with referred patients.
3. Supervision of staff rostered to the department.

Educational

1. Provision of course and instruction for staff in the principles of Dental Assistant Utilisation.
2. Lectures and clinical instruction for postgraduate and undergraduate students as required in Dental Assistant Utilisation.
3. Supervising preparation of audio-visual material for use within the Dental Clinical School and elsewhere as required.
4. Provision of continuing education courses for private dentists’ chairside assistants in the principles of Dental Assistant Utilisation.

Research

1. Supervision of and participation in research programmes within the department.

Specialist

Brief Summary of Duties

Responsible to the Director of Dental Services through the Director of Dental Assistant Utilisation. A Specialist Dentist (DAU) will be:

1. A dental graduate registered with the Dental Board of New South Wales who possesses a postgraduate qualification and has extensive clinical experience in general dentistry and DAU; or
2. A dental graduate who possesses a postgraduate qualification and has extensive clinical experience in general dentistry and DAU (Hospital recognised).

Within the Dental Assistant Utilisation Unit, the DAU Specialist’s duties will be determined and supervised by the department director.
Detailed Statement of Duties

1. To provide supervision and training of staff and undergraduate students, as required.
2. To attend departmental meetings to discuss procedures, protocols and standards of care.
3. To pursue and contribute to continuing education in dentistry through in-service programmes and the private dentist/chairside assistant courses.
4. To perform such duties as assigned by the Director of Dental Assistant Utilisation.
5. May be temporarily responsible for the department when the director is absent from duty for periods of one day or more.
6. Supervision and participation in research programmes within the department.
7. To adhere to the EEO Policies and Procedures of the Hospital.
8. To comply with relevant Occupational Health and Safety requirements.
9. A smoke free environment is the policy of the Western Sydney Area Health Service.

DAU Registrar/Senior Registrar

Brief Summary of Duties

Responsible to the Director of Dental Services through the Director of Dental Assistant Utilisation. A registrar will be a dental graduate enrolled in a postgraduate programme. Promotion to senior registrar may occur on demonstration of acquired skills or completion of a term of two years. Within the Dental Assistant Utilisation Unit, the DAU registrar/senior registrar’s duties will be determined and supervised by the department director.
Detailed Statement of Duties

1. To continue to perform the duties of a regular dental officer with an emphasis on complex restorative cases.

2. Instruct Westmead dental officers and chairside assistants in the basic principles of Dental Assistant Utilisation using:
   a. phantom heads
   b. real patients
   c. video tapes.

3. Evaluate the DAU trainees' performance in DAU.

4. Provide feedback to the DAU trainees regarding their performance.

5. Assist with the orientation of undergraduate dental students.

6. Assist with the training of Westmead dental chairside assistant students in the basic principles of DAU.

7. Participate with the presentation of the DAU continuing education course for private dentists and their chairside assistants, including the screening of patients.

8. Assist with the development of teaching materials (e.g., video tapes, slides, DAU manual, handouts).

9. To provide supervision and training of DAU staff as delegated by the director.

10. To attend departmental meetings to discuss procedures, protocols and standards of care.

11. To perform such duties as assigned by the Director of Dental Assistant Utilisation.

12. To assist the director with:
    Recommendations regarding organisational structure, equipment purchasing and staffing for the department.
    Maintenance of a high standard of preventive dental care within the department.
Liaison with nursing, reception and laboratory staff to ensure smooth operation of the department.

Maintenance of accurate records of treatment within the department.

Day to day management of the Dental Assistant Utilisation department.

Supervision of staff rostered to the department.

Lectures and clinical instruction for postgraduate and undergraduate students as required in Dental Assistant Utilisation.

13. May be temporarily responsible for the department when the director is absent for periods of one day or more.

14. Comply with the relevant Occupational Health and Safety requirements.

Research

1. Participation in research programmes within the department.

**DAU Demonstrator - Resident Dental Officer**

**Brief Summary of Duties**

Responsible to the Director of Dental Services through the Deputy Director of Dental Services. Within the Dental Assistant Utilisation Unit, the DAU Resident’s duties will be determined and supervised by the department director and/or designated senior staff (specialists, senior registrars and registrars).

**Detailed Statement of Duties**

1. Continue to perform the regular duties of a dental officer.

2. Instruct Westmead dental officers and chairside assistants in the basic principles of Dental Assistant Utilisation using:
   a. phantom heads
   b. real patients
   c. video tapes.

3. Evaluate the DAU trainees’ performance in DAU.
4. Provide feedback to the DAU trainees regarding their performance.

5. Assist with the orientation of undergraduate dental students.

6. Assist with the training of Westmead dental chairside assistant students in the basic principles of DAU.

7. Participate in the presentation of the DAU continuing education course for private dentists and their chairside assistants, including the screening of patients.

8. Assist with the development of teaching materials (video tapes, DAU manual, handouts).

DAU Demonstrator - Chairside Assistant

Brief Summary of Duties

Responsible to the Assistant Director of Nursing through the Senior Chairside Assistant for the department. Within the Dental Assistant Utilisation Unit, the DAU Assistant's duties will be determined and supervised by the department director and senior chairside assistant.

Detailed Statement of Duties

1. Participate with lectures and demonstrations to staff dental officers and chairside assistants using:
   a. phantom heads
   b. real patients
   c. video tapes.

2. Ensure all clinical bays in DAU clinic are well stocked with any special requirements for the next rotation.

3. Maintain stock required for courses, e.g. manuals, handouts, procedure cards.

4. Supervise and demonstrate clinical procedures during staff rotations and continuing education courses.

5. Tutor and demonstrate to private practitioners and their chairside assistants in postgraduate continuing education course.
6. Assist dental officers with treatment planning and time management.
7. Communicate with dentist instructions and responses required.
8. Assess progression and evaluate level of instruction required.
9. Use video taping as an active teaching instrument.
10. Conduct interviews and evaluations with dental officers during and at
    the conclusion of each clinical rotation.
11. Instruct dental chairside assistant students during their first clinical
    experience.
13. Assist with the development of teaching materials (video tapes, slides,
    handouts, procedures).

5.2.4 Facilities

The DAU clinic, although functioning as an independent unit, is in the same area as
the staff Clinical Dentistry Department and shares common support facilities such as
reception desks, satellite radiology clinics, back up laboratories and storerooms.

Apart from the six chair clinic, the DAU unit has a director’s office (which houses
the DAU computer), a DAU staff office and an audio-visual/seminar (A-VS) room.
The A-VS room is located at the rear of the clinic and houses two half-inch video
cassette recorders (VCR’s), a television monitor and a remote control facility for a
fully adjustable, colour video camera mounted centrally in the clinic. This camera
has full tilt and pan capability, adjustable focus and an ability to zoom in from a
wide shot showing the whole clinical bay to a very tight shot of approximately half
a metre radius centred on the patient’s mouth.

Also located in the A-VS room are two infra-red, remote control slide projectors
capable of dual projection. Apart from the two half-inch recorders, there is a three-
quarter inch multi-function VCR with its own monitor. This VCR is able to play video tapes produced from all the major video systems used in the world.

Aside from its audio-visual function, the A-VS room is used for the didactic presentation of the in-house dental officer/chairside assistant rotations. This includes during and post rotation seminars where feedback is given to the trainees via evaluation forms and a video tape of their clinical performance whilst in the DAU clinic. The video taping of private dentists and their assistants during continuing education courses is carried out in this room also.

The clinical facility is set up with six modern, fully equipped and functional chairs separated only by "half walls" between the bays. Each bay is set up identically and fully convertible for left-handed operation. The dental chairs are adjustable, supine contour chairs, while each bay has separate, mobile carts and ergonomic stools for both operator and assistant.

The operator's unit is equipped with a fibre-optic high-speed handpiece, a conventional slow to medium-speed handpiece, triplex syringe, ultrasonic scaler and curing light. The assistant's mobile cart is connected by an "umbilicus" to central suction and power giving each cart its own individual suction and power supply. The carts have a sliding top work surface which holds both high-speed and slow-speed suction and the triplex syringe. The assistant's cart has storage areas at the top and bottom separated by three drawers for storage of smaller items. Each bay also has two sinks and an operating light ceiling mounted.
5.2.5 Training Programme

At the present time (1992) the DAU unit conducts four formal training programmes each year. The first of these is a four week clinical orientation course for the first year student dental chairside assistants. This is held in February each year to coincide with the students first clinical experience. This is basically a familiarisation period for the student chairsides, under supervision by both a DAU Dentist and a DAU Assistant, into basic clinical procedures and protocols. It is felt that by early exposure to the principles of DAU the student chairsides will begin to develop good four-handed dentistry skills from the outset.

As a follow up to this limited DAU experience each student chairside assistant will spend a further four weeks in the DAU department in their second year of training. The students and the dental officers to which they have been assigned will rotate through the department as part of the staff dental officer/chairside assistant rotations, which is the second formal programme run by the unit.

The staff rotations are in blocks of four weeks and run continually for a five or six month period from March through July or August each year. The didactic component of the rotation is held during the first two days of each rotation. Along with mid-rotation and end-of-rotation evaluations this didactic component amounts to approximately 10 per cent or to some 18 hours out of a total of 160 hours spent in the department.

Teaching aids used during the didactic part of the course are slide lectures presenting the theoretical aspects of DAU, video tapes illustrating clinical techniques and clinical demonstrations on aspects of DAU such as setting up for a patient, correct positioning, suction tip placement, soft tissue retraction, access and visibility, instrument transfer and rubber dam placement. The trainees also view a "live"
clinical demonstration of a DAU Demonstrator team performing a Class II amalgam on a "real" patient.

As has been discussed previously there is a mid-course and end-of-course evaluation of the trainees. This is an opportunity for the DAU Demonstrator (Dentist or Assistant) to discuss the trainee's progress and advise on the correction of any problems that the trainee may be experiencing.

The remaining 90 per cent of the rotation is spent in the clinic treating patients. Trainee dental officers are assigned to a DAU Assistant whilst the DAU Dentists work with the trainee assistants. This ensures maximum exposure of all aspects of DAU to the trainees in a formalised training programme. Through experience, this has proven to be the most ideal teaching method. In the developmental stages of the DAU unit trainees would work together on patients after the first two didactic days of the rotation. This ended up being a case of the "the blind leading the blind" with neither team member having the knowledge and skill to recognise and solve efficiently and diplomatically any problems that arose.

Another important tool in the teaching of DAU is the use of the video camera. With the patient's permission an entire appointment can be recorded and viewed at a later date by the trainee and the DAU demonstrator. This has proven to be a highly successful teaching strategy with trainees showing keen interest in the videoing. Perhaps the key to the success of videotaping is the absolute objectivity of the video. The trainees are able to see for themselves in "black and white" (colour, actually) any mistakes that were made during the appointment. The video is also used for positive reinforcement of the good work practices that the trainees are developing.

At the end of each rotation the dental officer trainee and the DAU Assistant develop a series of procedure cards. These cards are word processed and laminated and kept by the dental officers so that at any stage a different assistant would be able to
follow these cards for each procedure. On the front of the card is a list of instruments and supplies that are required for each procedure. On the reverse side of the card is a list, in order, of steps that the dentist will follow, barring unforeseen circumstances, during that appointment.

The procedure cards have many benefits. They provide a check list for the assistant prior to the start of the appointment, thus eliminating a lot of unnecessary communication between the operator and assistant. It means that the assistant can set up for any procedure without needing the presence of the dentist to verbalise all the needs for any given appointment. By having the card located where it can be seen by the assistant means that the assistant can "anticipate" more successfully the dentists needs; the assistant can be one or two steps ahead of the dentist at any point in the procedure.

Another advantage with the procedure cards is that it forces the operator to think about and formalise the sequence of steps to be carried out during an appointment. This means greater predictability of the operator's needs and therefore a quicker, more efficient appointment.

The final two courses run by the DAU department are both aimed at private practice. These two courses are held from August to October each year. The third DAU training programme is a four day course for private dentists and their chairside assistants. A week's break is held between each of the first three days and a four week break between the third and final day. This allowed time between days of the course gives the private practice teams time to practise what they have learned after each day of the course. The current scheduling of days of the course has come about as a direct result of feedback provided by participants in past courses. Other aspects of these courses are improved accordingly.
This course is an abridged version of the staff rotation course, with 17 hours didactic and the remaining 15 hours in the clinic treating patients. All the teaching methods used during the staff rotations are employed in both courses for private practice dentists and assistants.

The fourth and final course run by the DAU department is one which is offered to dentists from private practice who have previously attended the third course. The course is, in fact, available only to other chairside assistants in the practice or to an assistant who may have joined the practice since the original course and is now working with the dentist who has completed the course. The fact that this is an "assistants only course" obviates the need for the dentist to attend the course for a second time. The added benefit is that the dentist can continue to practice therefore not losing any income which would normally be a hidden cost to the dentist being away from the practice.

This assistants only course is of four consecutive days duration. Of the 32 hours in the course 12 hours are didactic and the remaining 20 hours are spent full-time at chairside assisting the DAU Dentists with the treatment of their regular patients. The DAU Assistants assist in the supervision of the chairside assistants in the course.

An important aspect of the clinical components of all the courses run is that the type of dentistry performed is restricted as much as possible to restorative (including endodontics) cases. This ensures maximum chairside time devoted to four-handed procedures. To allow this to eventuate, a certain degree of control over the trainee's appointment book is required. Prosthetic patients and treatment not requiring active involvement of a chairside assistant are discouraged.

The DAU department has one other component to its teaching programme and that is lecturing, upon invitation, to interested study groups and societies. A two day
didactic only programme has been presented to a number of the Area Health Services (Dental) within the New South Wales Department of Health.
5.3 Summary

The DAU programme at Westmead Hospital Dental Clinical School has existed since the inception of the dental school in 1981 to the present time. One of the original goals for the unit was to see DAU become an integral part of the undergraduate dental curriculum. In 1991 a total of eight hours was devoted to any form of undergraduate training in DAU.

Although the DAU department has existed on equal footing with all other units within the dental school it wasn’t until 1991 that the department gained direct line of command with the Director of Dental Services. This led to independence for the department in determining teaching programmes, in financial control of the unit, in selection of equipment, materials and staffing and in the ability to liaise directly with supporting services such as nursing, clerical and laboratory.

The objectives of the department and for individual DAU trainees have been listed as has a statement of duties for each of the member of the DAU team. Details of the department’s facilities and its training programme have been outlined. The DAU unit provides training for 12 staff dental officer and chairside assistant teams each year via a four week rotation in the department. As well as providing "in-house" training, the DAU unit also "graduates" approximately 12 dentist-assistant teams (per year) from private practice through a four day continuing education course.

In 1991 another teaching course was offered by the DAU unit. This course is available to new or other assistants of private dentists who have completed the four day continuing education course previously. It is an "assistants only" course and relieves the dentist of having to attend the course for a second time. Over the past two years 24 chairside assistants have attended this course.
CHAPTER 6

MINIMUM REQUIREMENTS
FOR A DAU PROGRAMME

6.1 Introduction

The aim of this chapter is to present recommendations for the establishment of a Dental Assistant Utilisation (DAU) Programme. These recommendations are suggested minimum requirements for the satisfactory operation of such a programme. Requirements are detailed for a programme’s administration, objectives, personnel, facilities and its training component.

The material presented is based upon the literature reviewed, and presented earlier, regarding the experience of a federally funded nation wide undergraduate DAU programme which operated in the United States of America (USA) from 1959 to 1973. It is also based on the writer’s own experiences in the DAU unit at Westmead Hospital Dental Clinical School (WHDCS) from 1984 to 1992.

The requirements outlined in this chapter represent the results of the research described combined with personal experience of almost eight years working in an operational and successful DAU department.
6.2 Administration

One of the very basic fundamentals of any teaching programme is a solid administrative foundation. Specifically, any DAU training programme should operate as an independent, yet integral, part of the organisation in which the programme will be presented.

There should be a programme director who has both a fiscal and operational responsibility. This leads to an independence in such aspects from the selection of equipment and materials to the content of the teaching programme.

The experiences of the University of Kentucky (UK) in the development of its DAU programme bear repeating briefly. Prior to the revision of the programme in 1969, the DAU programme existed, since its inception in 1963, as a sub-programme of the operative dentistry department. This meant that any decisions involving DAU policy, equipment or personnel for example, were carried out at a higher level than the DAU director. With revision of UK’s programme came a much needed relationship between the programme director and the dean’s office.

At WHDCS DAU initially existed as a unit within the Preventive Dentistry Department. In 1991, with administrative restructuring, DAU gained direct line of command with the Director of Dental Services resulting in independence in determining teaching programmes, in financial control of the unit, in selection of equipment, materials and staffing and in the ability to liaise directly with supporting services such as nursing, clerical and laboratory.
6.3 Programme Objectives

The objectives for any teaching programme should be clearly defined and laid out. Importantly, these objectives should fulfil the requirements of the institution, whether it be a university (for example, Kentucky) or a teaching hospital such as Westmead. The objectives for each of these programmes have been listed previously.

One of the main objectives for a successful programme should be the integration of the programme into the mainstream of educational activities at a clinical level. Although a DAU programme must have its own identity, it must function in concert with the general clinical programme. An advantage of a programme not identified with a specific clinical discipline (such as operative dentistry or paediatric dentistry) is that it tends to engender acceptance by all departments.

The initial objectives of the National DAU Programme in the USA, when it commenced operation in 1961, were very broad in that they were directed towards the overall goal of increasing productivity, but without sacrificing the quality of treatment, and the comfort of patients and operating teams. These objectives were redefined in 1970 to become more specific and were also to be the subject of review by the Dental Student Training Advisory Committee (DSTAC). In evaluating individual programmes the committee was to determine whether the programme was conducted to reflect the Dental Assistant Utilisation Programme objectives.

One of the main problems at the University of Kentucky in its early years was that one of the programme objectives was to train dental students to train dental assistants at the same time that students themselves were learning to become proficient in the use of chairside assistants. The effect of this was to compromise the realisation of the original objective of the DAU legislation which was the training of dental students rather than of dental assistants.
Programmes at both the Universities of Texas and Colorado existed as a part of their respective TEAM programmes and as such did not have programme objectives that were only directed towards the training of dental students in assistant utilisation.

The programme at WHDCS had as its overall goal the teaching of health care providers how to work efficiently in a four-handed sit-down environment. General objectives are listed in the DAU Manual as well as specific objectives for participants in the various training programmes.

If DAU is to be a part of any undergraduate dental programme the ideas, objectives and principles of the programme should be introduced at an early stage in the student's career. Clinical participation should continue through all clinical years whenever possible. A student should not be introduced to clinical dentistry without the advantage of information and knowledge of the role of chairside assistants. A student should not be expected to practise in a standing position and then be told about the advantages of chairside assistants upon graduation.

Finally, trainees in any DAU programme should have a full-time dental assistant. Ideally, this assistant should be certified and especially trained as a DAU Demonstrator.
6.4 Personnel

It is the author's opinion that DAU staff should be appointed on a full-time rather than a part-time basis. The main reasons for this are continuity of teaching staff and a total commitment to DAU, rather than only a part-time, and perhaps not as effective, commitment.

All the personnel associated with a DAU training programme should have special training in four-handed dentistry as well as teaching and communication skills. The dental assistants should preferably be certified and have a team leader to co-ordinate the activities of the assistants. DAU Dentists should preferably have some years of clinical experience so as to be comfortable with the dentistry side as well as the teaching aspect of the programme.

DAU staff-to-trainee ratio should be one-to-one to achieve maximum exposure to correct application of DAU techniques. Therefore, in an undergraduate programme there would need to be an equal number of DAU Assistants as there were students in the programme at any one time. In fact, in the original pilot programme at the University of Missouri students were not permitted to initiate any type of treatment without the presence of a chairside assistant.
6.5 Facilities

As already discussed the DAU programme should exist as a separate entity; therefore it should have, and be in control of, its own facilities. Some of these, such as storerooms, reception desks and laboratories, may be shared with other clinical departments. Those facilities that are unique to, and required by, a DAU teaching programme should exist as physical belongings to that programme.

Aside from a separate clinical facility, the DAU unit or department should have office space for both the director and the other DAU staff. Ideally, a seminar room should be available for the presentation of various teaching aids, such as slide lectures and video tapes. Experiences from some DAU programmes in the United States and at Westmead in Australia have shown that the video taping of the clinical performance of DAU trainees is an invaluable teaching aid. For any DAU teaching programme this ability to video tape trainees should be considered as essential.

Clinical bays should have equipment which allows for the adequate training and performance of DAU. Criteria for such equipment has been presented in Chapter 2. An important factor in the selection or use of such equipment is that it should be easily converted for both right-handed and left-handed operating teams. The use of mobile units or carts more readily facilitates this capability.
6.6 Training Programme

As in any teaching programme there should be clearly defined goals and objectives. These goals and objectives can be attained through a combination of didactic and clinical instruction. Separate and formalised didactic and clinical components to the teaching programme should be detailed. Students as well teachers should have a proper knowledge and understanding of these aspects of the programme.

Didactic instruction can be covered by a combination of slide lectures, video tapes, clinical technique demonstrations, seminars and a DAU manual. Each of these techniques should be used appropriately; for example, a trainee can be best be taught the basics of instrument transfer by video and/or clinical demonstration rather than solely by lectures.

DAU trainees should be thoroughly oriented to the principles of Dental Assistant Utilisation prior to the clinical assignment. As to the ratio of didactic to clinical instruction, this will vary depending to the type of teaching programme being offered. The shorter a training programme is then the higher will be the didactic to clinical ratio. In the author’s experience a four week continuous exposure to DAU principles would be considered as the minimum. Such a four week programme would allow for approximately 10 per cent didactic and 90 per cent clinical instruction.

Fundamental to any teaching programme is the provision of feedback to trainees. This can take several forms, but preferably a written evaluation and a video of clinical performance should be considered essential.

An important aspect of the clinical instruction should be the scheduling of dental services that will maximise four-hands at chairside. This requires that there be some control over the patient flow through the DAU unit or department. This task can be undertaken by the programme director preferably, or by a patient flow co-ordinator.
Minimum Requirements for a DAU Programme

Equally as important as the type of dentistry to be performed by DAU trainees is the allocation of staff to such a programme. For every DAU trainee operator there should be a trained DAU Assistant. Similarly, for chairside assistants undertaking instruction in DAU there should be a one-to-one staff trainee ratio.
6.7 Summary

In this chapter the writer has presented what he considers to be minimum requirements for the successful operation of an undergraduate DAU programme. This material has been presented based upon the experiences of a federally funded nation wide undergraduate DAU programme which operated in the USA from 1959 to 1973. It is also based on the experience of the DAU programme at Westmead Hospital Dental Clinical School (1981-1992) which is directed at a continuing education level.

Recommendations

Administration

1. The programme should operate as an independent, yet integral, part of the organisation in which the programme will be presented.
2. There should be a programme director who has both fiscal and operational responsibilities.

Objectives

1. The programme objectives should be clearly defined and reflect the requirements of the institution.
2. The programme should be integrated into the mainstream of educational activities at a clinical level; it must function in concert with the general clinical programme.
3. The objectives should be introduced at an early stage of the undergraduate’s career and clinical participation should continue through all clinical years.

Personnel

1. DAU staff should be appointed on a full-time basis to ensure continuity of staff and total commitment to the programme.
Minimum Requirements for a DAU Programme

2. All personnel associated with the DAU programme should have special training in four-handed dentistry as well as teaching and communication skills.

3. The DAU staff-to-trainee ratio should be one-to-one to ensure maximum exposure to the correct application of DAU techniques.

Facilities

1. The DAU programme should exist as a separate entity and therefore should have, and be in control of, its own facilities.

2. Those facilities that are unique to, and required by, a DAU training programme should exist as physical belongings to that programme.

3. The DAU unit should be a separate clinical facility with office space for both the director and the other DAU staff. Ideally, a seminar room should be available for the presentation of various teaching aids, such as slide lectures and video tapes.

4. The ability to video tape clinical performance has been shown to be an excellent teaching aid and as such should be considered essential.

5. Clinical bays should have equipment which allows for the adequate training and performance of Dental Assistant Utilisation. This equipment should be standardised, easily converted for both right-handed and left-handed operation and utilise mobile units or carts whenever possible.

Training Programme

1. Programme goals and objectives should be attained through a combination of didactic and clinical instruction.

2. Trainees should be thoroughly oriented to the principles of Dental Assistant Utilisation prior to the clinical assignment.

3. There must be some facility for the provision of feedback to trainees.

4. The scheduling of dental services should maximise four-hands at chairside.
CONCLUSION

There have been a number of studies in the literature, from as early as 1943, concerned with the effect of chairside assistants on the productivity of a dental practice. Productivity increases of anywhere from 33 per cent (with one assistant) to 75 per cent (with two assistants) have been demonstrated.

For any DAU programme to function effectively there has to be a thorough understanding of the basic principles of Dental Assistant Utilisation. Equipment must allow the operating team to practise dentistry in an efficient and comfortable fashion. A complete knowledge of the principles of work simplification and motion economy is required if the dental team is to avoid movements that consume time or produce fatigue. This knowledge allows the team to sit correctly, to pass instruments and supplies safely and efficiently and to use a pre-set tray system which promotes a simple, efficient means of instrument delivery. The advent of high-speed suction and the use of rubber dam affords both comfort and safety to the patient whilst providing for maximum isolation and evacuation of the operative field.

In September 1960, the Council on Dental Education, American Dental Association and the American Association of Dental Schools, co-sponsored a Conference on Utilisation and Training of Dental Assistants. The objective of this conference was to evaluate the experimental programmes which had been held at six dental schools in the United States of America since 1957.

Without exception, the participating schools reported that the chairside assistant projects had proved their value as judged by two standards: in the students’ increased productivity as a result of working with an assistant in the clinic; and in the favourable change of attitude on the part of the students toward the employment of an assistant when they enter practice.
Illinois reported an average increase of 37 per cent in surfaces restored over a year's time, while Minnesota measuring the number of restorations completed in an hour, reported that the study group using assistants did 10 to 15 per cent more than the group without assistants. A study of attitudes at Minnesota also revealed that students in the experiment were convinced of the value of an assistant and that the students were even more favourably impressed at the end of the experiment than at the beginning. Iowa reported that the gross income of its paedodontic clinic had doubled as a result of using assistants. Alabama found that both the quality and quantity of work performed by superior and inferior students improved when the students were teamed with an assistant. North Carolina conducted a poll of its senior students on practice plans and found that 94 per cent of the students expected to employ assistants as soon as they began practice.

The experiences at the Universities of Missouri and Kentucky have shown that successful DAU programmes can exist at an undergraduate level. Both schools demonstrated that it is essential the programme exist as a separate entity with a direct line of command with management. This ensures that there is independence in determining teaching programmes, in financial control of the programme, in selection of equipment, materials and staffing and in the ability to liaise directly with supporting services such as nursing, clerical and laboratory.

Although at the present time in Australia dental students do have access to chairside assistants, how these assistants are utilised leaves a lot to be desired. Final year dental students at the University of Sydney use assistants mostly for obtaining and delivering instruments and supplies rather than having the assistants at chairside assisting with the clinical procedures. This compares with the United States where, since 1961, all dental students have undergone some formal training in the correct utilisation of dental assistants.
In 1992 in Australia there is only one formal training programme in Dental Assistant Utilisation. This highly successful programme, at Westmead Hospital Dental Clinical School, operates on a graduate level providing instruction in assistant utilisation to staff dental officers and chairside assistants. It also offers continuing education courses in DAU to private dental practitioners and their assistants.

The experience in the United States has proven conclusively that a DAU programme can operate effectively at an undergraduate level. The success of the continuing education DAU programme at Westmead has shown that there exists a definite need for some form of training in assistant utilisation in Australia.

In this treatise the writer has made recommendations regarding the requirements he considers essential for the successful operation of a DAU programme. These requirements have been detailed in terms of administration, curriculum objectives, personnel, facilities and training programmes offered. It would be hoped that this paper be the basis for the establishment of an undergraduate training programme in Dental Assistant Utilisation.
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