Increasing Productivity by Effective Use of Four-Handed Dentistry - Part 1: An Overview of the Concept

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Disclaimer: Participants must always be aware of the hazards of using limited knowledge in integrating new techniques or procedures into their practice. Only sound evidence-based dentistry should be used in patient therapy.

Introduction
This course is the first of a three-part series and describes and discusses four-handed dentistry and its integration in the modern dental office.

Conflict of Interest Disclosure Statement
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Overview
This course is designed to review the impact that four-handed dentistry can make on productivity in the dental practice. New technology continues to be integrated into the modern dental office. However, no single product can increase productivity and reduce stress and strain on the dental team as much as using the concept of four-handed dentistry.

The clinical dynamics of four-handed dentistry is an ergonomic chairside concept performed by a well-trained dental team in an organized manner. Combined with the practice of ergonomics in the workplace, the concept of true four-handed dentistry must be revisited by the dental profession and applied to both the clinical and business areas of the practice.

The concept of four-handed dentistry was born in the 1960s to overcome a manpower shortage. Demands were made on the dental profession to provide more services to more people due to the creation of third party payment. As the years have passed, this single concept, when done properly has become even more important. Even though the current economic period may have diminished the need based on third party payment, the profession must still seek to be more productive as the impact of regulatory agencies, managed care, and quality assurance places even greater demands on the practicing dentist to implement efficient clinical practice methods to ensure a safe, comfortable environment for the entire team. In this course the reader will explore the reasons why the concepts of true four-handed dentistry, when applied to current technology, can increase productivity and reduce stress.

Learning Objectives
Upon completion of this course, the dental professional should be able to:

• Identify the basic tenets of true four-handed dentistry.
• Describe motion economy.
• Identify the basic zones of activity.
• Explain why the concepts of true four-handed dentistry can increase productivity.
• Identify dental team responsibilities to ensure effective four-handed dentistry.
• Identify positive phrases to implement positive attitudes toward change.
• Understand how a microscope can improve chair position.
• Examine equipment to increase visibility.
• Understand the most ergonomic ways to deliver dentistry.
• Understand how the concepts of motion economy and ergonomics can apply to both the clinical and business areas of the dental practice.

Introduction
Consider a typical schedule in the dental practice and ask yourself at the end of the day, “Am I physically tired tonight? Have I felt stressed during the day?” Then consider if the staff is being inundated by regulatory agency requirements and are also feeling exhausted at the end of the day: “If there were some other way I could practice all day and overcome my daily fatigue, would I want to do this?” Think about a single procedure and count the number of times you must raise your head to look for an instrument - five, ten, or even more? Then ask yourself how many times you had to extend your arm to reach for some piece of equipment?
How often do you need to refocus your eyes from the oral cavity to an instrument, or to a mixing pad with a dental material on it?

Do you want to modify your practice style and work smarter and not harder? Then this course is for you. This course will focus on the principles of true four-handed dentistry and how these concepts can bring about change in thinking that promotes organization, practices ergonomics, and can increase productivity all that result in reducing stress and strain on the dental team.

True four-handed dentistry is the methodology of a team comprised of highly skilled clinical practitioners working together in an ergonomically designed environment to improve productivity of the dental team and improve the quality of care for dental patients while protecting the physical well-being of the operating team. More simply stated, to watch a dental team practice true four-handed dentistry is like watching a soccer game. Each team member keeps his or her eye on the ball or site of the procedure and is prepared to perform the next assignment at the proper time until the task is completed. In the case of soccer, the ball is passed, a goal is scored, or the other team regains the ball. In the dental procedure, the treatment is completed with success.

Four-handed dentistry is simply not transferring instruments from one person to another nor is it “hurry-up” dentistry. True four-handed dentistry is the way to work smarter, not harder. Many dental teams over the years have learned to exchange instruments with each other but have not studied the research that defined the tenets of true four-handed dentistry. To realize the true concepts of four-handed dentistry, one should study the experts whose work pioneered this movement. Drs. Richard Brauer and Richard Barton of the University of North Carolina, Dr. Shailer Peterson of the University of Tennessee, Dr. G.E. Wuerhmann, Dr. Glen Robinson, Gertude Sinnet, and Ed Mc Divitt of the University of Alabama, Dr. James Bush of the University of MI and later Dr. Joseph Chasteen of the University of MI were all pioneers whose valuable research laid the foundation to what today still forms the basis for true four-handed dentistry. The reader of this course would benefit much by returning to the literature of one or more of these experts to learn how these concepts were developed.

Despite the keen interest in the issue of ergonomics in the dental workplace by the Occupational Safety and Health Administration (OSHA), few dental schools teach the concepts of true four-handed dentistry as part of the curriculum. A few dental schools have allocated funds in their budgets to provide some skilled clinical assistants to work at chairside with the dental students throughout an entire procedure, but this tends not to be a mandate for all dental schools today. Assistants may be on staff in a dental school but not all of these persons have had training in true four-handed dentistry and often are not full time employees whose primary assignments are to work with the dental student full time at chairside to maximize productivity and minimize stress. Thus, today many dental graduates learn four-handed dentistry on the job, from formally trained dental assistants, or from assistants who themselves have been trained on the job.

**Basic Tenets of Four-Handed Dentistry**

Many dental teams claim they practice four-handed dentistry, yet they still suffer the results of physical stress due to the use of inappropriate equipment and techniques that fall short of meeting the basic tenets of the true four-handed dentistry concept. Dentists can still be observed changing their own burs, reaching for an instrument, refocusing their eyes after looking away, or twisting and turning to reach equipment on their side of the chair. If the clinical assistant is not in charge of all instrument transfers and the equipment is not within reach of the assistant, true four-handed dentistry cannot be practiced.

Don't overlook the application of these concepts in the dental business office. Though this course is designed primarily for the clinical area of the dental practice, take time to evaluate the practices in the business office as the staff there, too, may find many of these principles can easily be applied to the business office.

The concept of true four-handed dentistry is based on a set of criteria that define the conditions under which efficiency can
be attained. To practice true four-handed dentistry, the following criteria must be met:

1. Use ergonomically designed equipment to minimize unnecessary motion.

2. Place the patient in supine position.

3. Seat the operating team and patient comfortably in ergonomically designed equipment.

4. Practice motion economy.

5. Seat the operating team as close to the patient as possible with the legs of the assistant parallel to the patient chair.

6. Utilize preset trays.
   a. Minimize the number of instruments to be used.
   b. Place instruments in sequence of use.
   c. Place in order from left to right or top to bottom as preferred.
7. Position equipment, instruments, and materials in advance.

8. The dentist assigns all legally delegable duties to qualified clinical assistants based on the state's guidelines.

9. Patient treatment is discussed with the patient and planned in advance in a logical sequence.

**Principles of Motion Economy**

Motion economy refers to the manner in which human energy is conserved while performing a task. The objective in all areas of the dental office, clinical, business or laboratory setting should be to minimize the number and magnitude of motions and conserve energy while working. Ask yourself the following questions: Simplification and reduction of body motions to simplify and reduce work content.

1. How many times do you turn your body or reach for an instrument?

2. Does the assistant eliminate operator stress by transferring the instruments and materials to the operator?
3. Does the assistant have primary responsibility for transfer of materials and instruments or is the assistant often unoccupied while the dentist reaches for an instrument or changes a bur?

4. Are the handpieces and instruments within a 21-inch radius of the assistant?

5. Are these same ergonomic concepts applied to the dental business office to minimize unnecessary motion and reduce stress?
Think about your daily activities and decide how you can modify the routine to reduce motion. Plan ahead to ensure all materials are prepared in advance in a motion effective environment. Perhaps it will be necessary to reorganize a procedure or rearrange materials to achieve this goal.

In the business office, examine the location of equipment and modify the location as necessary to reduce the need to reach or strain the body to gain access to commonly used materials and equipment.

**Classification of Motion**

Motions can be classified into five categories according to the length of the motion as shown below:

**Class I.** Movement of the fingers only as when picking up a cotton roll.

**Class II.** Fingers and wrist motion as used when transferring an instrument to the operator.

**Class III.** Fingers, wrist, and elbow as when reaching for a handpiece.

**Class IV.** The entire arm and shoulder as when reaching to change the light position.

**Class V.** The entire torso as when turning around to reach for equipment from the fixed cabinetry.
Strategies for Conserving Motion
Motion economy should be the primary consideration when purchasing and positioning dental equipment since this concept reduces or eliminates the number and length of motions used during basic treatment procedures. To improve motion economy at chair side, consider the following suggestions:

1. Decrease the number of instruments used for a procedure by maximizing the use of each one for multiple functions.

2. Position the instruments on a preset tray/cassette in the sequence that they will be used.

3. Position instruments, materials, and equipment in advance, whenever possible.

4. Have back up supplies and larger armamentarium located in easy reach to avoid Class V motion or the need to leave the operative site.

5. Place the armamentarium on a mobile cart as close to the patient as possible.
6. Place the patient in a supine position.

7. Seat the operating team as close to the patient as possible.

8. Place the assistant’s legs parallel to the patient chair to ensure the assistant is close to the patient and will not need to reach.

9. Use operating stools that promote good posture and provide back and abdominal support that adjusts vertically and horizontally.

10. When using a microscope maintain good posture and allow the assistant access to the transfer zone.

11. Provide work areas that are 1 to 2 inches below the elbow. Notice, too, the business assistant’s thighs are parallel to the floor regardless of the height of the stool.
12. Minimize the number of eye movements between the close and brightly lit operating field and more distant objects in the treatment room with lower illumination.

13. Reduce the length and number of motions made by the operator and the dental assistant to accomplish routine and repetitive tasks.

14. Use smooth continuous motions and avoid distracting zigzag movement.

15. Avoid Class IV and V motions.

Zones of Activity
All treatment activity evolves around the patient. Before equipment selection can be considered, the dental team must be aware of special functional spatial relationships around the patient at chair side. The work area around the patient is divided into four “zones of activity.” Zones of activity are identified using the patient’s face as the face of a clock. The four zones are: the operator’s zone, assistant’s zone, transfer zone, and static zone. The zones are depicted for a right-handed operator in (Figure 1). The zones are reversed for the left-handed operator in (Figure 2).

The operator’s zone for a right-handed operator extends from 7 to 12 o’clock, the assistant’s zone from 2 to 4 o’clock, the instrument transfer zone from 4 to 7 o’clock, and the static zone from 12 to 2 o’clock. The operator changes position dependent upon the dental arch and tooth being treated. The assistant seldom moves much in the zone of activity, but may find it necessary to raise the operating stool when working on the mandibular arch to improve the line of sight into the oral cavity.

These zones are self-explanatory except for the static zone, which is the zone of least activity. Instruments that are infrequently used such as the blood pressure equipment, portable curing light, or the assistant’s mobile cabinet when not in use can be stored in this area.

An awareness of the zones of activity is important since they should serve as guides for the dental team in locating equipment as well as positioning the patient and operating team to facilitate access to the operative field and improve visibility. The second course of this two part series reviews the selection of dental equipment for use in an ergonomic, four-handed dental practice.

Strategies to Ensure Effective Four-Handed Dentistry

Teamwork
To effectively implement the concepts of true four-handed dentistry each member of the dental team must assume individual as well as team responsibilities. The team must be aware of each other’s needs, recognize the need to reposition...
Figure 1. Zones of Activity for a right-handed dentist.

Figure 2. Zones of Activity for a left-handed dentist.

the patient and operating team, as necessary, to reduce strain, improve access and visibility, and reduce unnecessary movement by transferring instruments only within the transfer zone.

**Strategies for the Operator**
- The dentist/operator must be willing to accept input from the assistant when it is noted that chair positions need to be adjusted.
- The operator must maintain a working position within the operator’s zone.
  - Avoid legs interfering with the static or assistant’s zone.
  - Confine eye focus to the field of operation.
  - Confine hand and arm movement to the transfer zone.
- Avoid twisting and turning to reach instruments by relying on the assistant to change burs and to transfer needed instruments.
- Exchange instruments only in the transfer zone.
- Avoid removing instruments from the preset tray by returning instruments to the assistant.

**Strategies for the Dental Assistant**
- Develop a thorough understanding of the procedure.
- Recognize the patient's needs.
- Anticipate the operator's need, and recognize any change in the procedure.
- Be seated as close to the patient as possible with legs parallel to the long axis of the patient's body.
- Be alert to changes in position of the dentist and determine a non-verbal signal to indicate to him or her that chair positioning needs to be improved.
- Maintain the order of both the instruments and dental materials according to their sequence of use.
- When transferring a dental instrument to the operator, orient the working end of the instrument so it is pointing up for maxillary functions and down for mandibular functions.
- Work with the operator to establish and follow a safe, standardized, and predictable instrument transfer protocol.
- When practical the dental assistant should change burs in the handpiece and maintain a “ready position” for delivery of the handpiece.
- Remove debris from instruments before returning them to the preset tray.
- Maintain a clean work area at all times.

Communication between the operator and the assistant is vital to successfully implement the concepts of true four-handed dentistry.
Chair Positioning Using a Microscope
With the introduction of microscope usage into dentistry during the last decade or more, not only do microscopes improve magnification of the operative field but they have provided improved ergonomics at chairside. It is wise in many situations to include a microscope for the assistant. This will enable the assistant to know exactly what is happening and recognize any change in the procedure.

Microscopes actually deliver on the promise of comfortable sit-down-dentistry. Using the microscope the dentist no longer needs to twist and bend the body to obtain good visibility. The microscope provides its own light source and is directly positioned over the oral cavity like a dental light. Essentially the dentist sits motionless and is able to sit at the 12 o’clock position even while working with mandibular molars by learning to bring the patient to him or her, instead of attempting to bring him or herself to the patient. The assistant using a microscope along the side of the dentist can also maintain good chair positioning while being able to anticipate the next needed instrument. The dentist can adjust the patient’s head with minimal movement to improve patient positioning in order to improve the dentist’s operating posture.

Fifteen Excuses for a Closed Mind Toward the Practice of Ergonomic Concepts in Four-Handed Dentistry
This author has heard them all. Some of the most common reasons or excuses for not practicing ergonomics in dentistry are listed below. These reasons have been given by dental professionals of all ages; some with newly designed offices and others with offices that were designed 20 or more years ago.

1. I am too connected to the old way.
2. We are not competent in those techniques.
3. It seems like a nuance that will not last for long.
4. It would be a major change in our routine.
5. We are already exhausted and our time is saturated with so much technology now.
6. How do I know we won’t be worse off than we are now?
7. I know this equipment and I will lose control if we have to change.
8. It costs too much.
9. That is how the equipment is designed, so I just work around it.
10. It’s too radical a change.
11. It just seems like more work.
12. My staff may want more money if we increase production.
13. I don’t think my patients will like it.
14. It’s not required by OSHA.
15. It just won’t work in our office.

Video Demonstrations of Four-Handed Dentistry Concepts

Video 1. Classification of Motion. 
Click on image to view video online.

Video 2. Operator Positioning. 
Click on image to view video online.
The video segments are excerpts from the videotape entitled, “Clinical Dynamics of Four-Handed Dentistry,” and used with the permission of Health Sciences Products, Birmingham, Alabama. The entire video tape can be purchased at:

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**Conclusion**

In this brief overview the reader has been exposed to the basic principles of four-handed dentistry. These principles allow the practitioner to work smarter, not harder. When the concepts discussed in this article are applied to the dental team’s daily practice, it is likely that the team will identify areas that relate to increased stress and reduced productivity. If so, keep an open mind and begin today to determine how changes can be made to modify your mode of practice to make it more productive and less stressful.
Course Test Preview
To receive Continuing Education credit for this course, you must complete the online test. Please go to: www.dentalcare.com/en-us/professional-education/ce-courses/ce428/start-test

1. True four-handed dentistry is the ____________.
   a. use of a dental assistant together with the dentist
   b. concept of skilled dental professionals working together in an ergonomically designed environment to improve productivity, quality of care, and physical well-being of the operating team
   c. use of faster techniques to cut down on chair time
   d. use of the latest equipment using microscopes

2. To practice true four-handed dentistry, all of the following criteria must be met EXCEPT:
   a. The operating team and patient are seated comfortably in ergonomically designed equipment.
   b. Motion economy is practiced.
   c. Preset cassettes/trays are utilized.
   d. The dentist is in charge of all instrument transfers.

3. Considering the five categories of motion classification, a Class III motion is when ____________.
   a. the entire arm and shoulder as when reaching into a supply tub
   b. fingers and wrist motion as used when transferring an instrument to the operator
   c. movement of the fingers only as when picking up a cotton roll
   d. fingers, wrist, and elbow are used, as when reaching for a handpiece
   e. the entire torso as when turning around to reach for equipment from the fixed cabinetry

4. The zones of activity in four-handed dentistry include all of the following EXCEPT:
   a. The operator’s zone.
   b. The activity target zone.
   c. The assistant’s zone.
   d. The transfer zone.
   e. The static zone.

5. The zones of activity that should be avoided to decrease stress during chairside procedures are ____________.
   a. Class I and II
   b. Class II and III
   c. Class IV and V

6. Strategies for the operator/dentist in four-handed dentistry include all of the statements listed below EXCEPT:
   a. Confining eye focus to the field of operation.
   b. Avoid twisting and turning to reach instruments.
   c. Always provide distinct verbal instructions for each instrument exchange.
   d. Use non-verbal signals to indicate instrument transfers.
   e. Confine arm and hand movement to the transfer zone.
7. **Strategies for the dental assistant in four-handed dentistry include:**
   a. Maintaining the order of both dental instruments and materials according to their sequence of use.
   b. Developing a thorough understanding of the procedure, recognize the patient’s needs, anticipate the operator’s need, and recognize any change in the procedure.
   c. Working with the operator to establish and follow a safe, standardized, and predictable instrument transfer protocol.
   d. All of the above.
   e. None of the above.

8. **If one moved the entire torso to reach for an instrument on the counter, this would be a motion classified as _________.**
   a. Class I
   b. Class II
   c. Class III
   d. Class IV
   e. Class V

9. **The team must be aware of each other’s needs, recognize the need to reposition the patient and operating team, as necessary to reduce strain, improve access and visibility, and reduce unnecessary movement by transferring instruments only within the transfer zone.**
   a. True
   b. False

10. **Some of the excuses for not practicing ergonomic dentistry are ___________.**
    a. “It would be a major change in our routine.”
    b. “We are already exhausted and our time is saturated with so much technology now.”
    c. “How do I know we won't be worse off than we are now?”
    d. “I know this equipment and I will lose control if we have to change.”
    e. All of the above.

11. **The operator’s zone for a right-handed operator extends from 7 to 12 o’clock, the assistant’s zone from 12 to 3 o’clock, the instrument transfer zone from 4 to 7 o’clock, and the static zone from 12 to 2 o’clock.**
    a. True
    b. False

12. **When using a microscope the dentist is able to sit at which position and maintain good vision while moving the patient’s head into the path of vision?**
    a. 7 o’clock
    b. 11 o’clock
    c. 12 o’clock
    d. 2 o’clock
13. **Suggestions for conserving motion in dentistry include:**
   a. Decrease the number of instruments used for a procedure by maximizing the use of each one for multiple functions.
   b. Place the patient in a supine position.
   c. Provide work areas that are 1 to 3 inches below the elbow.
   d. Reduce the length and number of motions made by the operator and the dental assistant to accomplish routine and repetitive tasks.
   e. All of the above.
   f. None of the above.

14. **The computer keyboard should be 1-3 inches below elbow height.**
   a. True
   b. False

15. **The principles of motion economy practiced in the treatment room can also be applied to the dental business office.**
   a. True
   b. False
References

About the Author

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Betty Ladley Finkbeiner, is a Faculty Emeritus at Washtenaw Community College in Ann Arbor, MI where she served as Chairperson of the Dental Assisting Program for over three decades. She has served as a consultant and staff representative for the American Dental Association’s (ADA) Commission on Dental Accreditation and as a consultant to the Dental Assisting National Board. She was appointed to the Michigan Board of Dentistry from 1999-2004.

Ms. Finkbeiner has authored articles in professional journals and co-authored several textbooks including: Practice Management for the Dental Team, Comprehensive Dental Assisting: A Clinical Approach, Review of Comprehensive Dental Assisting, and a handbook entitled Four-Handed Dentistry: A Handbook of Clinical Application and Ergonomic Concepts. She has co-authored videotape productions including: Medical Emergencies for the Dental Team, Four-Handed Dentistry, An Ergonomic Concept, and Infection Control for the Dental Team and lectured to dental school classes and many dental meetings. In 2010, she was awarded the ADAA Journal Award for the article, Managing Cultural Differences in the Dental Practice. In 2017 Betty was featured in the DANB Certified Press for her over fifty year career as a Dental Assistant. Currently retired, she continues to write, lecture and provide consultant services in ergonomic concepts to practicing dentists throughout the country.

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