Increasing Productivity by Effective Use of Four-Handed Dentistry – Part 3: Instrument Transfer Technique

Course Author(s): Betty Ladley Finkbeiner, CDA-Emeritus, BS, MS
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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 third of a three-part series and reviews the transfer of dental instruments for use in an ergonomic, four-handed dental practice.

Conflict of Interest Disclosure Statement
• The author reports no conflicts of interest associated with this course.

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Overview

The purpose of this course is to aid you in the transfer of instruments in the practice of efficient four-handed dentistry. The efficient exchange of instruments between the operator and the dental assistant is fundamental to the facilitation of an efficient and stress-free dental practice. This requires a commitment on the part of the members of the operating team to specific work practices before and during a dental procedure. This course examines various instrument transfers and rationale for each. In addition to the descriptions and figures, the course contains a video presentation of the proper transfer techniques in a clinical setting.

Learning Objectives

Upon completion of this course, the dental professional should be able to:
- Describe and discuss each team member’s responsibilities during an instrument transfer.
- Recognize and discuss specific instrument transfer techniques including the single-handed transfer, two-handed transfer, hidden syringe transfer, pen grasp, modified pen grasp, palm grasp and palm thumb/thumb-to-nose grasp.
- Discuss the benefits of a proper instrument transfer technique.
- Review and understand questions to be asked before purchasing patient dental chairs, operator and assistant’s stools, mobile cabinets, and dental unit delivery systems.
- Discuss the required commitment on the part of the members of the operating team to specific work practices before and during a dental procedure.
- Describe the role of an additional set of hands as used in six handed dentistry.
- Describe the need for required practice on the part of the team in order to attain proficiency.

Introduction

Skillful instrument transfer has become a primary result of time and motion studies in dentistry. Use of an efficient instrument transfer is one of the basic skills every dental team must learn in order to be productive and stress free. Instrument transfer is the process of transferring instruments and materials to and from the operator, within the transfer zone, at a precise moment of need (Figure 1). An important pre-requisite to successful instrument transfer is the ability of each member of the dental team to understand the procedure, anticipate each other’s needs, and when necessary develop some form of communication—either verbal or non-verbal to indicate a need for instrument exchange. This concept may seem basic, yet many dentists and assistants struggle to refine a smooth productive technique.

During the past years there has been a diminished emphasis on formal education in the
basic principles of true four-handed dentistry concept including the use of efficient instrument transfer techniques. This has resulted in dentists not learning proper ergonomic strategies in dental school or following graduation due to fewer continuing education courses being offered on the subject. These dentists tend to engage in more time consuming movements during dental procedures than is necessary. Proper instrument transfer techniques serve to:

a. conserve motion
b. increase the smooth flow of the procedure
c. reduce eyestrain by eliminating the need to look away from the brightly illuminated operative field during the transfer

It is advisable to re-evaluate the instrument transfer techniques used during a dental procedure in order to ensure safety during the transfer and ensure that the objectives of a proper technique as listed below are realized:

• The assistant understands the sequence of the treatment procedure.
• The assistant anticipates the needs of the operator.
• The assistant transfers the dental instrument in the proper hand; the left hand for right handed operators and the right hand for left handed operators.
• The assistant holds the oral evacuator in the hand not being used to transfer the instrument; right hand for the right handed operator and left hand for the left handed operator.
• When using the air/water syringe it is held in the hand opposite the hand holding the oral evacuator; that is the transfer hand.
• When the transfer occurs the A/W syringe is transferred to the opposite hand holding the oral evacuator. For a short period of time the tip of the A/W syringe can be grasped with a couple of fingers while holding the oral evacuator.
• The instrument is transferred to the operator in the position of use, which would result in the working end of the instrument downward for the mandible and upward for the maxilla so the operator is able to use the instrument once received without the need to reposition the instrument.
• The assistant delivers the instrument firmly to the operator.
• The operator is able to maintain vision on the operative field thus reducing eyestrain associated with changing light intensity and focal length accommodation.

• The used instrument is received back by the assistant without any entanglement of instruments.
• The operating team conserves time and motion during instrument transfers.
• There is a reduction in stress and strain on the operating team due to the uninterrupted flow of the procedure without the delays associated with locating and delivering instruments if an orderly system is not used.
• When instrument transfer is used in conjunction with the oral evacuator and the air/water syringe, the operative site will always be clean and the next instrument will be ready for use.
• Percutaneous injuries associated with use of dental instruments can be minimized using a prescribed transfer technique.

Team Responsibilities During Instrument Transfer

Basic Principles
Successful instrument transfer is predicated on a set of principles that require organization and planning in advance. These principles include:

1. Work from a well-defined treatment plan so that instruments and materials required for a planned procedure can be prepared in advance.
2. Team members must thoroughly understand the procedure to be performed in order to anticipate the sequence in which the instruments and materials will be used.
3. Develop a standardized routine for the performance of most dental procedures that is followed routinely.

Additional strategies such as the delegation of all material preparation and instrument transfer to the assistant as well as the delegation of expanded/advanced functions to legally qualified clinical assistants will maximize the use of the dentist's time. Using ergonomically designed equipment and placing the patient in a supine position improves access and visibility for the operating team (Figure 2). Placing supportive equipment and supplies within a 21-inch radius of the assistant's hands as well as confining movements to the oral cavity and the adjacent transfer zone over the patient's chest will result in the conservation of time and motion during the procedure.
To ensure a successful instrument transfer, each member of the team must assume specific but often related responsibilities.

**Operator Requirements**
In order to maximize the efficiency of an instrument transfer technique, the operator should maintain a fulcrum for his/her working hand in the oral cavity so the actual location of the transfer between team members will be predictable. The number of instrument exchanges during a typical restorative procedure may exceed 100. By making an instrument exchange predictable, there is no need for the operator to look away from the oral cavity during the procedure. Follow these guidelines for smooth safe transfers:
- Use a non-verbal signal to indicate a need to exchange an instrument; this avoids tedious and repetitious verbal communication throughout the workday.
- Withdrawal of the used instrument from the operative field serves as a non-verbal signal and it repositions the used instrument for better access by the dental assistant (Figure 3).
- Place the used instrument in his/her hand in a position that enables the assistant to safely retrieve it.
- The assistant grasps the used instrument.
- The assistant transfers the new instrument.

**Maintain**
- Eyes on the operative field.
- Refrain from removing instruments from or replacing instruments onto the pre-set tray (Figure 4).

**Assistant Requirements**
In order to maximize the efficiency of an instrument transfer technique, the assistant needs to follow these guidelines:
- Maintain instruments on a pre-set instrument tray or cassette in the sequence of use in order to facilitate rapid location of needed instruments during a procedure (Figure 5).
- Anticipate the need for the next instrument.
- Stay alert, with eyes on the operative field, for any change in the procedure.
- Be ready to modify the sequence of instruments when necessary.
- Place the instrument to be transferred in proper position of hand.

- Position the working ends of instruments need for the proper dental arch; up for the maxilla and down for the mandible.
- Receive the used instrument from the operator.
- Use positive pressure during the transfer of the instrument to ensure the operator senses that the instrument has been delivered; this eliminates the operator from looking away.
from the site or fumbling the delivered instrument.
- Move used instrument back into hand to be placed, remove debris from the instrument.
- Replace on the tray in the appropriate position or into transfer position if the instrument is to be used again.

**Team Requirements**
In order to maximize efficiency and safety during an instrument transfer it is advisable for the operating team to observe patient movement, especially during the exchange of an anesthetic syringe or other sharp instruments.

Following a safe standardized transfer procedure should be used to avoid injuries. Safe techniques include the maintenance of firm control of the instrument at all times, exchanging instruments only in the transfer zone over the patient’s chest and avoiding unpredictable movements during the transfer. Laying instruments or material on the patient’s napkin should be avoided to prevent injury and potential litigation.

**Instrument Grasps**
- The **pen grasp** resembles the position commonly used to hold a pen or pencil and is widely used for most operative instruments (Figure 6).
- The **modified pen grasp** is similar to the pen grasp except the operator uses the pad of the middle finger on the handle of the instrument. Some operators prefer this method since they feel it provides more strength and stability in some procedures.
- The **palm grasp** is used for bulky instruments. It is commonly used for surgical forceps, rubber dam clamp forceps, straight chisels and the air/water syringe (Figure 7).
- The **palm-thumb, or thumb-to-nose grasp** is used by the assistant for holding the oral evacuator. The operator may use this with instruments that require a more vertical movement (Figure 8).

**Types of Instrument Transfer**

**The Single-Handed Transfer**
The single-handed instrument transfer with a right-handed operator is illustrated in the following procedural outline (Figure 9).
- Assemble instruments in sequence of use and place the instrument tray as close to the patient as possible. The tray may be positioned in a vertical or horizontal position (Figure 10).
• If a tray or cassette is not used as in some dental specialties, prepare the materials in a logical sequence of use (Figures 11 & 12).
• Place auxiliary equipment such as the anesthetic syringe, or rubber dam on the mobile cabinet farthest from the patient.
• At the beginning of the procedure simultaneously pass the mirror with the right hand and the explorer with the left hand (Figure 13).
• Pick up the instrument to be transferred in the left hand and position it between the first finger and thumb at the non-working third of the instrument (Figure 14).
• Rest the instrument on the middle finger, making certain that the working end is positioned for the correct arch and position it within 10-12 inches from the operator’s hand in readiness for a transfer when needed (Figure 15).
• The operator signals for an exchange by moving the instrument being used from the tooth and bringing it outside the mouth. When possible, a finger rest may be maintained (Figure 16).
• The assistant grasps and tucks the used instrument toward the wrist with the pick up portion of the hand (Figure 17).
• The new instrument is delivered into the operator’s hand with the delivery portion of the hand and the operator returns to the mouth with the new instrument (Figure 18).
• With the thumb, the assistant rolls the instrument from the palm up to the ring finger until it is above the first knuckle. Take care to avoid puncturing the gloves (Figure 19).
• Fold the index and middle fingers under the handle and return the instrument to the holding position (Figure 20).
• If the instrument is not to be used again, it can be returned to the proper position on the tray.
• When the air-water syringe and the oral evacuator are used, the assistant places the air-water syringe in the right hand to free the other for the instrument transfer (Figure 21).

Bulky instruments can be transferred in the same single handed exchange as described above. Many dental units, such as the split unit, prohibit effective handpiece transfer since the handpiece is outside the 21-inch radius of the assistant's hand. This unit placement leads to decreased effectiveness in terms of time and motion. When a transthorax unit is used and handpieces are within the transfer zone, the assistant should then utilize the following procedure:
• The handpiece is made parallel with the instrument to be exchanged (Figure 22).
• The return of the handpiece in the pick up portion of the assistant's hand is done in the same manner as any other instrument even though it is bulkier. For this reason, the two fingers used in the pick up method provide greater stability (Figure 23).
• The handpiece is then returned to the dental unit.

The Two‑Handed Transfer
The two-handed transfer is used when transferring bulky instruments such as the
rubber dam clamp forceps or surgical forceps (Figure 24). This transfer requires the assistant to pick up the used instrument with one hand and deliver the new instrument with the opposite hand. This exchange requires more movement and limits the use of the HVE and air-water syringe.

**Hidden Syringe Transfer**

The hidden syringe transfer is named as such because it takes place out of view under the chin of the patient. It enables the operator to receive the anesthetic syringe safely and out of the patient’s line of sight thus avoiding undue patient stress. This transfer also occurs within the transfer zone.

This transfer requires that the assistant and operator plan in advance the technique to avoid the potential of a needle stick. Often the operator prefers to transfer the instrument behind the patient. This area is outside the transfer zone, causing the assistant to use a Class V movement and violate safe transfer. This transfer can be adapted to the use of wand type anesthesia very effectively. Care should be taken that the base unit is located nearby the assistant for easy access. Using a traditional anesthetic syringe the following steps may be followed:

- A 2 x 2 gauze is passed to dry the site. Topical anesthetic may be applied with a cotton-tipped applicator if desired (Figure 25).
- The protective cap on the needle is loosened slightly (Figure 26).
- The syringe is held in the assistant's right hand when assisting a right-handed operator while the assistant stabilizes the operator's hand using a firm grasp (Figure 27).
- The operator positions the right hand upright with the index, and middle fingers extended along with the thumb to receive the syringe. While the assistant holds the operator's right hand firmly the thumb ring of the syringe is positioned over the operator's thumb and lowered to rest between the awaiting index and middle fingers.
- The assistant's hand carefully removes the protective cover while maintaining the firm grasp of the operator's right hand to avoid any inadvertent movement. Once the cap is removed and the assistant's right hand is away from the exposed needle the operator's hand can be released to signal that the syringe is ready for use.
- The cover is placed into the recapping device while the operator administers the anesthetic (Figure 28). If the patient is a small child, the assistant can gently place his or
her arms over the child to prevent a sudden movement that could result in injury during the injection procedure.

• The retrieval of the syringe is similar to the delivery in that, using the left hand, the assistant grasps the operator’s right hand upon withdrawal of the syringe from the patient’s mouth to hold it in a predictable position. The assistant then grasps the syringe by the barrel to avoid contacting the contaminated needle. A gauze sponge is exchanged for the syringe to use as a compress over the injection site.

• The syringe is placed in a recapping device (Figure 29). Though it requires a movement out of the operator’s zone, some operators prefer to replace the syringe in the recapping device to avoid a potential accident.

• The mouth may be rinsed at this time if any anesthetic was dropped on the tongue.

• It should be noted that some operators prefer to transfer the syringe to the recapping device behind the chair. This is acceptable, but does require the dentist to reposition his or her body and move the eyes from the operative field, but may provide more comfort if the potential for a needle puncture is possible.

Special Instruments or Situations
There will be times or situations that dictate modification of the single-handed transfer. The following suggestions may aid during these times.

Delivery of the Dental Mirror and Explorer
• These two instruments are transferred simultaneously by the assistant at the beginning of most dental procedures.

• The dental mirror is picked up by the handle end using the right hand. At the same time the explorer is picked up with the left hand at the one third of the instrument handle nearest the assistant (Figure 30a).

• Position the instruments in the delivery portion of the hands and when the operator signals, pass in the same manner as described in the section above (Figure 30b).

• The mirror can be retrieved with the right hand at the conclusion of the procedure.

Use of Non-Locking Tissue Forceps
• If non-locking forceps are used, the assistant must maintain a grasp on the forceps to ensure the beaks do not separate during transfer.

• After the material to be transferred has been placed into the forceps beaks the forceps are paralleled with the used instrument that is to be exchanged (Figure 31a).
• The instrument is exchanged in the same manner as other instruments (Figure 31b).
• When the forceps are returned to the assistant, the working end of the forceps is grasped in the palm of the hand to eliminate dropping the contents (Figure 31c).
• The forceps are not rolled back into position, but rather the assistant discards the materials from the forceps and returns the instrument to the tray.

Delivery of Small Items
• Small items such as a cotton applicator can be passed to the operator as any other instrument (Figure 32a).
• Medicaments can be passed by first passing the insertion instrument and then holding the pad with the medicament in the transfer zone for easy access to the operator (Figure 32b).

Delivery of Scissors or Hinged Instruments
• The assistant picks up the scissors from the tray with the left hand; opens the handles slightly and parallels the scissors with the instrument to be exchanged (Figure 33a).
• The operator modifies the hand position by placing the thumb and first or second finger into the rings of the handle (Figure 33b).
• The scissors are returned with the beaks pointing toward the assistant (Figure 33c).

Six-Handed Transfer
Often in situations such as endodontic surgery utilizing high powered microscopes are used by both the dentist and assistant for improved visibility (Figure 34).

In this case, a third set of hands becomes valuable in retraction and preparation of materials. While the first clinical assistant is attentive to the treatment on a specific site the second clinical assistant must anticipate the needs of both the primary assistant as well as the operator. All of the previous instrument transfer techniques are still followed during basic instrument transfer. However, but the second assistant may need to be on the side of the operator to avoid congestion and to gain improved visual access (Figure 35).
Use of Isolite

The Isolite system is a minimally invasive, easy-to-use alternative to traditional forms of isolation (such as rubber dam and manual suction & retraction). The dental isolation system is becoming popular in many dental practices because it gives the practice unprecedented control of the oral environment. The key to the systems' effectiveness is the family of Isolite Mouthpieces that are used with the system. Isolite Systems offers a full suite of morphologically and anatomically correct mouthpieces designed to fit the spectrum of patients, making it easy to have effective isolation for every mouth of every size. The system, shown in Figure 36, enables the clinician to practice more efficiently as the tongue and cheek are readily retracted with the Isolite Mouthpiece in place. The maxillary and mandibular quadrants are isolated simultaneously. The mouthpiece obturates the throat to prevent inadvertent aspiration of fluids and oral debris. At the same time, fluids are continuously aspirated and oral humidity is
controlled at approx. 43%. Isolite Mouthpieces come in a variety of sizes (from Pediatric to Large Adult) and are easy to insert and comfortable for the patient.

**Video Demonstration of Instrument Transfer Methods**
The proper Instrument Transfer Methods outlined in this course are demonstrated in this video clip.

**Conclusion**
Use of standardized instrument transfer techniques can yield significant benefits for the operating team. Like most psychomotor skills practice is required before proficiency can be achieved. The effort required is worthwhile if the team wants to maximize efficiency, safety, and reduce stress throughout the workday. To be successful in instrument transfer the dental team must practice and establish consistent procedural steps for common procedures. In addition the dental team must develop a communication system that ensures understanding between the individuals to recognize when an instrument is needed or in what location some type of action must take place.
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/ce430/start-test

1. It is the responsibility of the assistant to anticipate any changes in instrument needs based on observations of the treatment procedure as noted in the oral cavity.
   a. True
   b. False

2. Some operator's prefer to replace the anesthetic syringe to the recapping device him or herself. This is acceptable, though it requires movement on the part of the operator.
   a. True
   b. False

3. In the “Single-Handed Transfer” the assistant's hand is divided into two parts which consist of __________.
   a. thumb/finger and palm portions
   b. finger tips and open hand
   c. little finger area and thumb-finger area
   d. pick up and delivery portions

4. When transferring an instrument when the A/W syringe and oral evacuator are both being used, the A/W syringe is transferred to the hand holding the oral evacuator for a short period of time.
   a. True
   b. False

5. The benefits of proper instrument transfer techniques include:
   a. Percutaneous injuries associated with use of dental instruments can be minimized using a prescribed transfer technique.
   b. Reduction of neck strain for the patient.
   c. The operator is able to maintain vision on the operative field thus reducing eyestrain associated with changing light intensity and focal length accommodation.
   d. A and B
   e. A and C
   f. A, B, and C
   g. C only

6. The use of an Isolite system provides illumination, retraction, and oral evacuation as well as obturation to prevent debris going into the throat area.
   a. True
   b. False

7. When transferring the dental handpiece, the __________.
   a. handpiece is made parallel with the instrument to be exchanged.
   b. return of the handpiece in the pick up portion of the assistant’s hand is done in the same manner as any other instrument even though it is bulkier.
   c. handpiece must be transferred to the palm of the operator due to its increased bulk.
   d. A and B
   e. A and C
   f. A, B and C
8. When transferring scissors, the operator modifies the hand position by placing the thumb and smallest (little) finger into the rings of the handle.
   a. True
   b. False

9. When using a “Single-Handed” instrument transfer with a right-handed operator, all of the following are true EXCEPT:
   a. Assemble instruments in sequence of use and place the instrument tray as close to the patient as possible. The tray may be positioned in a vertical or horizontal position.
   b. Place auxiliary equipment such as the anesthetic syringe, or rubber dam on the mobile cabinet closest to the patient.
   c. At the beginning of the procedure simultaneously pass the mirror with the right hand and the explorer with the left hand.
   d. Pick up the instrument to be transferred in the left hand and position it between the first finger and thumb at the non-working third of the instrument. Rest the instrument on the middle finger, with the working end positioned for the correct arch.

10. The two-handed transfer is used when transferring bulky instruments such as the rubber dam clamp forceps or surgical forceps. This transfer requires the assistant to pick up the used instrument with one hand and deliver the new instrument with both hands.
    a. True
    b. False

11. Concerning the assistant’s requirements during instrument transfers:
    a. As the instrument transfer begins, the working ends of instruments need to be positioned for the proper dental arch; up for the maxilla and down for the mandible.
    b. During the transfer the assistant needs to use positive pressure to ensure the operator senses that the instrument has been delivered; this eliminates the operator from looking away from the site, or fumbling the delivered instrument.
    c. Immediately after the transfer debris from the used instrument should be removed before returning it to the tray or to the operator for use again.
    d. All of the above.
    e. None of the above.

12. The three most common methods used by an operator to hold an instrument are:
    a. Palm-thumb grasp, pen grasp and palm grasp.
    b. Palm grasp, pen grasp and thumb-to-nose grasp.
    c. Palm grasp, pen grasp and palm-thumb grasp.
    d. Palm grasp, modified pen grasp and pen grasp.
    e. Palm grasp, finger-thumb grasp and pen grasp.

13. Following a safe standardized transfer procedure should be used to avoid injuries. Safe techniques include the maintenance of firm control of the instrument at all times, exchanging instruments only in the transfer zone over the patient’s chest and avoiding unpredictable movements during the transfer.
    a. True
    b. False
14. Placing supportive equipment and supplies within a ________ radius of the assistant’s hands as well as confining movements to the oral cavity and the adjacent transfer zone over the patient’s chest will result in the conservation of time and motion during the procedure.
   a. 12-inch
   b. 18-inch
   c. 21-inch
   d. 24-inch

15. Six-handed dentistry in Endodontics may require a clinical assistant to perform all of the following EXCEPT:
   a. Additional retraction
   b. Material preparation
   c. Increased visibility
   d. Final point insertion
References

About the Author
Betty Ladley Finkbeiner, CDA-Emeritus, BS, MS
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.

Email: blf1927@embarqmail.com